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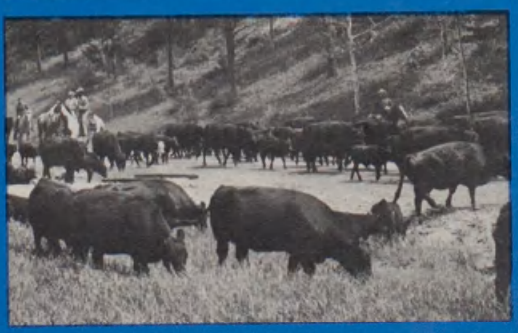

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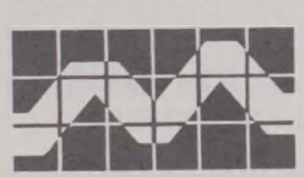

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In This Issue

THE DEAN'S COMMENTS

The School of Business Administration through its Bureau of Business and Economic Research is very proud and especially pleased to present this "proceedings" issue of the Montana Business Quarterly. *Most of this issue comes from presentations made in the "Montana's Economic Outlook" seminars conducted in four Montana cities in January.*

A genesis

I would like you to know something of the seminars and their genesis. In 1970-71, the Bureau completed the *Montana Economic Study*, a thorough investigation and analysis of the state's economy conducted over a two-year period and financially supported by federal and state funds. Major findings including some projections of future conditions were reported at a one-day conference held in Great Falls in December 1970. A less than warm reception was given to some of the findings—not because of anything related to the study's approach but because the conclusions were not popular; they did not predict, as many hoped, a bright rosy future for the state's economy and the course of its development.

Analyses and predictions grow stale and are made obsolete and of limited use with the passage of time. This, coupled with mounting concerns about the seemingly slow economic growth in the state, prompted a review of economic trends, developments, and conditions in 1974. The review was undertaken jointly by the Bureau of Business and Economic Research and the Department of Agricultural Economics and Economics at Montana State University at the request of Governor Thomas L. Judge, and an *Economic Report to the Governor* was delivered in January 1975. The report generated a good bit of interest and its highlights were presented to several state and local groups.

As the national economic downturn of 1974 continued into 1975 with only limited recovery, it seemed propitious to reexamine the Montana economy and report recent developments and the near-term outlook to larger interested audiences. Thus the long-dormant desire and widely recognized need to provide better and more current information on Montana's economy led to the Bureau's commitment to present a series of Economic Outlook seminars.

The seminars

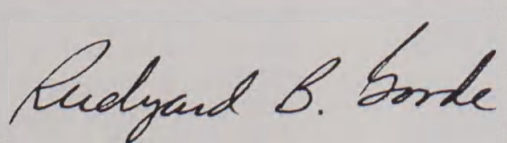
With the support and sponsorship of local chambers of commerce, trades and labor councils, and several individuals, the Bureau presented one-day seminars in Billings, Great Falls, Helena, and Missoula. The two morning presentations were repeated in each city, and these constitute the first two articles of this issue. In Missoula the afternoon session was devoted to the wood products industry. (This is the third article.) In the other cities the afternoon session dealt with Montana coal and energy developments. The last article in this issue of the *Montana Business Quarterly*

contains an analysis of coal gasification by Richard Stroup and Walter Thurman of Montana State University, Department of Agricultural Economics and Economics. Some of the afternoon presentation was based on this article. Because the bulk of the material presented by Paul Polzin at the afternoon sessions dealing with Montana coal and energy questions was published in the Autumn 1974 issue of the *Quarterly* under the title, "Water Use and Coal Development in Eastern Montana," it is not included here.

Of special attraction were the luncheon speakers. In Billings, Great Falls, and Missoula, Samuel B. Chase, Jr., former University of Montana faculty member and now a consulting economist in Washington, D.C., spoke on "Our Strained Financial System." Chase also served as an advisor to the Board of Governors of the Federal Reserve System. Duane W. ("Doc") Bowler, editorial page editor of the *Billings Gazette*, spoke of "An Outsider's View of State Government" at the Helena seminar.

In praise and gratitude

For myself the seminars were a rewarding, but demanding, experience. The assistance provided by the several sponsors was exceeded only by the warm and thoughtful reception and responses at the seminars. To all who helped, our deep gratitude. Our luncheon speakers performed admirably—and injected a welcome and less intensely focused element to the programs. Special praise must go to the Bureau staffers: Maxine Johnson, Director, and Paul Polzin, Research Associate—both of whom have faculty appointments in the School's Department of Management—gave their usual outstanding and effective performances. Joyce Zacek, Editor, did yeoman service in planning and making all the local arrangements. Thanks to her careful attention and thoroughness the seminars came off well. Joyce deserves our gratitude and a special tribute. Maybe we'll do it again next year.



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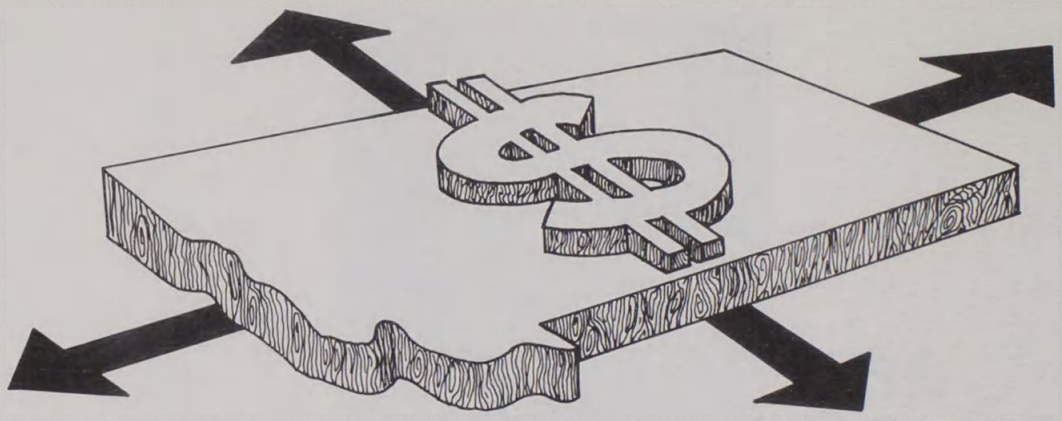


MONTANA'S ECONOMY where it's been and where it's going

MAXINE C. JOHNSON

Maxine C. Johnson is Director of the Bureau of Business and Economic Research and Professor of Management in the School of Business Administration at the University of Montana, Missoula.

Is the state economy turning the corner? Well, maybe

What we are most interested in, of course, is where Montana's economy is going. But in order to predict where we may be going in Montana, we have to understand where we are now and how we got there.

So I shall spend a few minutes talking about the past—about what happened to the Montana economy between 1950 and 1970 and then about what seems to have been happening since 1970.

I break the discussion into these two time periods for a reason: We have very good information for the period 1950 to 1970, because we have census figures for 1950, 1960, and 1970. We have confidence in their accuracy and in our interpretation of the Montana economy during the fifties and sixties.

But in 1975 we are in an awkward position, halfway between the 1970 and 1980 census. The information we have isn't so good and we're not so sure how to interpret it. Because of this I'll spend more time talking about what appears to us to be conflicting evidence about recent economic developments in Montana.

Then we'll discuss more recent history—the 1974-75 recession and how it has affected Montana. And we'll do a little speculating about what 1976 may bring.

Let's go back in history and look at Montana during the fifties and sixties. Montana's economy performed rather poorly during those decades. There weren't enough jobs to go around and incomes fell behind national averages. As a result, a good many Montanans went looking for opportunity elsewhere. Here's what happened to Montana's population between 1950 and 1970:[1]

	Montana	United States
Population		
1950	591,600	151,000,000
1960	676,000	179,000,000
1970	694,000	203,000,000
Percent Change		
1950-60	*14*	*18*
1960-70	*3*	*13*
Net Migration		
1950-60	-25,000	2,600,000
1960-70	-58,000	3,000,000

Montana's population grew much more slowly than the U.S. population because of heavy outmigration. During the sixties 58,000 more people moved out of Montana than moved in. That's the "net migration" figure there on the bottom line. In the 1950s, 25,000 more had moved out than in. Now, people move for many reasons, but we think most of these people left to look for greater economic opportunities.

One of the reasons why we think this is so is because of the slow growth of employment during the fifties and sixties. Figure 1 shows how much more slowly employment grew in Montana than in the United States between 1957 and 1970. (We begin with 1957 because that is the earliest year for which we have annual figures for Montana.) We can see how the gap widened during the late sixties, as U.S. employment grew much more rapidly.

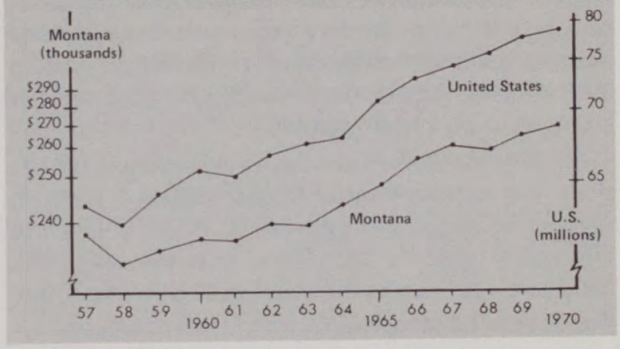
It isn't surprising, then, that unemployment in Montana was quite high (figure 2). Throughout this period it generally was higher in Montana than in the United States. Towards the end of the sixties, the spread became larger.

So we had a slow growth of employment, and we had unemployment generally higher than in the United States as a whole. It's no surprise, then, that incomes grew slowly. Figure 3 shows per capita income in Montana and the United States from

[1]Source: U.S. Bureau of the Census, *Census of Population*, 1950, 1960, and 1970.

Figure 1

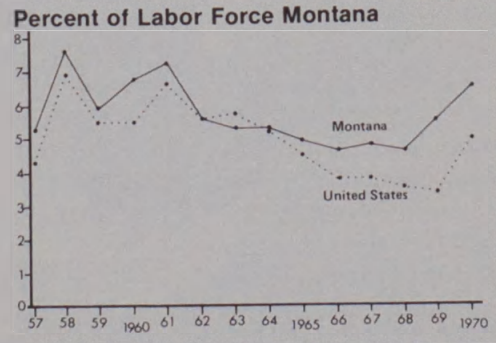
Employment in Montana and the United States, 1957-1970



Ratio scale.
Sources: Montana Department of Labor and Industry, Employment Security Division and U.S. Department of Labor.

Figure 2

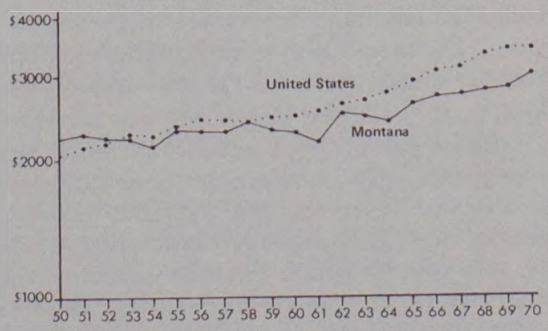
Unemployment in Montana and the United States, 1957-1970



Sources: Montana Department of Labor and Industry, Employment Security Division and U.S. Department of Labor.

Figure 3

Per Capita Income in Montana and the United States, 1950-1970



1967 dollars. Ratio scale.
Source: U.S. Department of Commerce, Bureau of Economic Analysis.

1950 to 1970. Per capita income is total income divided by total population—in other words, average income per person. It includes not only wages and salaries but proprietors' income, property income, welfare payments—any kind of income that individuals receive. The figures are in 1967 dollars, that is, they have been adjusted for changes in purchasing power.

In 1950, Montana's per capita income was higher than that for the United States—about 8 percent higher. In about the mid-fifties, it fell below the U.S. figure, and it's been lower ever since. In 1970, Montana's per capita income was 12 percent below the national average.

"Many Montanans went looking for opportunity elsewhere during the fifties and sixties"

Now there are several things to say about these income figures. First, per capita income *did* increase in Montana— it was 34 percent higher in 1970 than in 1950 after adjustment for price changes, and this is a significant increase. But for the country as a whole, the gain amounted to 64 percent. Montanans were not sharing in the national prosperity to the same extent as most other Americans.

Second, we use per capita income as an indicator of economic well-being because it's the best comparison we have. We know that Montanans enjoy many benefits that cannot be expressed in dollars, and we also know that human welfare does not depend on income or material well-being alone.

Third, since per capita figures are averages, they hide some very great differences in individual incomes. We have some people with very high incomes in Montana and some with very low incomes. The proportion in each of these groups is somewhat smaller here than in the United States.

And, finally, if you're wondering why Montana's per capita income jumps around so much more than the U.S. figure, the answer is agriculture. In almost every case, the big ups and downs in Montana income are related to agriculture. In 1954, 1959, 1961, and 1964, farm incomes were down and so was per capita income in the state. The years when per capita income was high generally were prosperous years for agriculture.

So by national standards and in terms of jobs and income, Montana's economy performed rather poorly during the fifties and sixties. Let's look at the reasons why.

Mostly it was because of the makeup of Montana's industrial base. In studying regional economies, economists often divide industries into two groups. One group consists of primary or basic industries—those that produce goods and services for sale outside the region. Primary industries are thought to provide the basis for growth. The other group we call derivative industries—those that mostly serve the local population. Changes in derivative industries usually can be related to changes in primary industries.

Montana's primary or basic industries are agriculture, mining, manufacturing, railroads, and the federal government:[2]

Primary Employment, Montana

	1950	1970	Change
Total	103,300	85,100	-18,200
Farm	52,800	36,100	-16,700
Nonfarm	50,500	49,000	- 1,500
Mining	10,200	6,600	- 3,600
Manufacturing	18,000	23,900	5,900
Railroads	14,000	6,600	- 7,400
Federal government	8,300	11,900	3,600

If you wonder why railroads are considered as a basic industry, it's because they haul a lot of goods across the state for out-of-state businesses. Federal employees manage the federal lands not just for Montanans but for all Americans, and decisions affecting employment are made outside the state.

"In almost every case, the big ups and downs in Montana income are related to agriculture"

Between 1950 and 1970, we lost over 18,000 jobs in these primary industries. Agriculture, of course, was the big loser—16,700 workers—as farms grew larger and more mechanized. Mining lost 3,600 jobs—mostly because of the switch from underground to open pit mining. Railroads cut their employment by over 7,000 as they changed from steam-powered to diesel engines, and as they automated their switchyards. Only manufacturing and the federal government employed more people in 1970 than in 1950.

[2]Source: Montana Department of Labor and Industry, Employment Security Division.

Montana's experience in losing jobs in agriculture, mining, and railroads was not unique. It was happening all over the United States. Our problem was that those industries were more important here than in the country as a whole. We had too many eggs in the wrong baskets.

So, we had a net loss of 18,000 jobs in our primary industries over the two decades, mostly because of new production methods and new technology which increased productivity and reduced the need for workers in agriculture, mining, and railroads. Now, primary industries generally are the industries where pay scales are the highest, and that was the case here. Montana lost a lot of good jobs

"Between 1950 and 1970 we lost over 18,000 jobs in primary industries"

during the fifties and sixties. We don't always think of agriculture as a high income activity, but the average income per agricultural worker (including proprietors) in Montana is nearly always higher than the average for nonfarm workers (including the self-employed).

The industries that increased their employment and kept total employment growing (although not very fast) were the derivative industries—those industries which mostly serve the local population.[3]

Derivative Employment, Montana

	1950	1970	Change
Total	125,200	180,600	55,400
Utilities (except railroads)	7,900	10,800	2,900
Construction	10,500	11,000	500
Trade	36,700	48,100	11,400
Services and finance	23,400	41,800	18,400
State and local government	20,000	40,700	20,700
All other	26,700	28,200	1,500

Those industries are the utilities (except railroads), construction, wholesale and retail trade, services and finance, and state and local government. The "all other" consists mostly of self-employed people in nonfarm industries, especially construction, retail trade, and services. The big gainers were trade, services and finance, and state and local government. As you know, these industries also were growing nationally. As people grow more affluent they demand more goods and service, both public and private. And because these are industries where productivity increases quite slowly, employment expands to fill the increased need.

Mostly because of the growth in trade, services, and government, total employment in Montana was higher in 1970 than in 1950:[4]

Total Employment, Montana

	1950	1970	Change
Total	228,500	265,700	37,200
Primary industries	103,300	85,100	-18,200
Derivative industries	125,200	180,600	55,400

Women workers accounted for all of the increased employment; the number of men employed in the state actually declined between 1950 and 1970.

This shift in employment from primary to derivative industries goes a long way toward explaining why Montana's per capita income grew so slowly. What we did was replace jobs in Montana's primary industries (which paid an average of $9,600 per year back in 1970) with jobs in derivative industries (where the average worker earned less than $6,000 in 1970).

Another reason Montana's per capita income fell below the national average was that a smaller proportion of our population was in the labor force. Most of those people who left the state were in the working age groups, so the state's population was heavily weighted with children and older people. And although Montana women were going to work in increasing numbers during this period, the percentage of working women was smaller here than in the United States as a whole.

[3]Ibid.

[4]Ibid.

As the seventies began, then, Montana's economy was not in very good shape. The past twenty, and especially the last ten years—the sixties—had been a period of falling behind, and our prospects for the seventies didn't seem much better.

But now, halfway through the decade, there is some indication that things are changing, that they are getting better. According to the figures we have, population and employment are increasing more rapidly in Montana than in the United States. Our incomes compare a little better with the national figure.

"We had more new jobs in Montana between 1970 and 1974 than we had in the twenty years from 1950 to 1970"

Figure 4 compares population and employment changes in Montana and the United States between 1970 and 1974. Keep in mind that Montana really didn't feel the recession much until late in 1974, so we're comparing a pretty good year in Montana with a recession year nationally. It may make us look better than we deserve. The Census Bureau reports that population increased 6 percent in Montana and 4 percent in the United States between 1970 and 1974. The Employment Security Division, Montana Department of Labor, and the U.S. Department of Labor estimate employment increases of 14 percent in Montana and 8 percent in the United States. We had more new jobs in Montana between 1970 and 1974 than we had in the twenty years from 1950 to 1970.

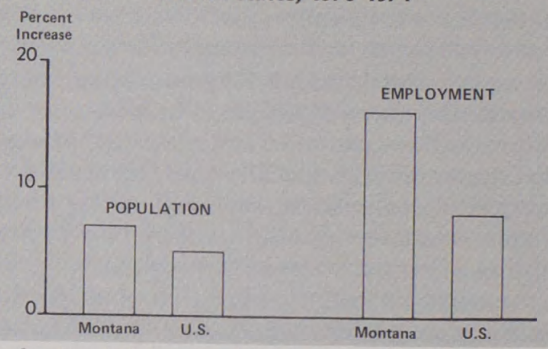
Even so, unemployment stayed higher than in the United States, running about 6 percent most of the time, and getting up close to 7 percent in 1974 (figure 5).

Per capita income grew a little faster in Montana (figure 6). In 1974 it was only 9 percent below the national figure, compared to 12 percent below in 1970. The large increases in Montana's per capita income in 1972 and 1973 were the result of big gains in farm income.

We don't think there's any doubt that Montana did better in the early seventies than it did in the sixties. But we think some of these figures ought not to be taken at their face value. So let's take a closer look at what happened between 1970 and 1974.

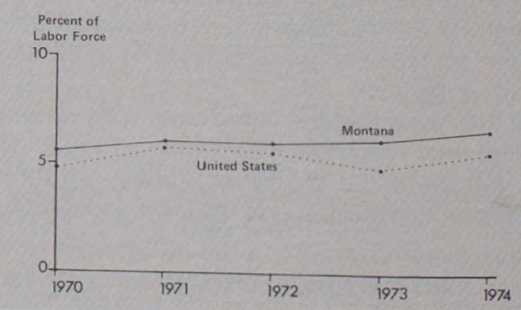
There are two reasons why Montana's economy turned in a better performance. One reason is high

Figure 4
Changes in Population and Employment, Montana and the United States, 1970-1974



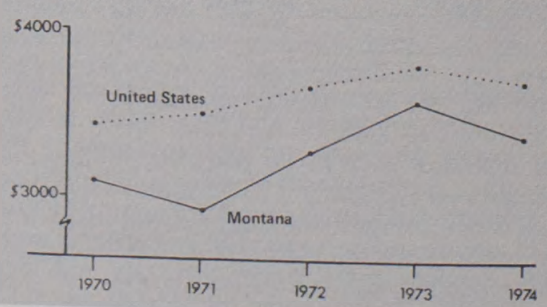
Sources: U.S. Bureau of the Census, U.S. Department of Labor, and Montana Department of Labor and Industry, Employment Security Division.

Figure 5
Unemployment in Montana and the United States, 1970-1974



Sources: Montana Department of Labor and Industry, Employment Security Division and U.S. Department of Labor.

Figure 6
Per Capita Income in Montana and the United States, 1970-1974



1967 dollars. Ratio scale.
Source: U.S. Department of Commerce, Bureau of Economic Analysis.

farm income and the other is an apparent increase in primary employment.

The single biggest influence on the state as a whole was farm income. It began to increase in 1972; in 1973, after adjustment for changes in price levels, it was almost double the postwar average. It declined in 1974, but still was very high. This new-found prosperity of farmers and ranchers gave the state quite a boost and certainly contributed to employment and income in Montana towns serving agricultural areas.

Montana's other primary industries also contributed to the improved record. Here are employment figures for 1970 and 1974.[5]

Primary Employment, Montana

	1970	1974	Change
Total	85,100	86,400	1,300
Farm	36,100	35,100	-1,000
Nonfarm	49,000	51,300	2,300
Mining	6,600	7,500	900
Manufacturing	23,900	24,300	400
Railroads	6,600	6,500	- 100
Federal government	11,900	13,000	1,100

Remember that between 1950 and 1970 primary employment in Montana declined by about 18,000, and that that decline was the major reason for Montana's poor economic performance during the fifties and sixties. Since 1970 primary employment may have begun to grow. I say "may" for several reasons. One is that the 1974 figures are estimates. They are pretty good estimates, but there are possibilities for error—especially in agricultural employment, which is very difficult to measure.

The figures for nonfarm primary employment are much more reliable. Most of the new nonfarm jobs were provided by mining and the federal government. If we look more closely at mining employment, we see that 400 of the new workers were coal miners in eastern Montana. Another 400 new jobs opened up in petroleum and gas production and non-metallic mining:[6]

	1970	1974	Change
Mining	6,600	7,500	900
Metal mining	4,000	4,100	100
Coal mining	100	500	400
Other	2,500	2,900	400
Manufacturing	23,900	24,300	400
Food products	4,300	4,100	- 200
Wood products	8,200	9,300	1,100
Primary metals	4,700	3,400	-1,300
Other	6,700	7,500	800

[5]Ibid.
[6]Ibid.

I don't think the increase in manufacturing employment really amounted to 400 workers. The year 1970 was a very poor one for the lumber industry and employment was way down. In 1974, in spite of some shutdowns late in the year, average employment was quite high. So the 1,100 increase in employment in wood products between 1970 and 1974 exaggerates the actual growth. We think the number of new jobs was really around 800—that is what the increase was between 1960 and 1973, both pretty good years for the forest industries. If wood products only provided 800 new jobs, that almost wipes out the overall gain in manufacturing employment.

That big decline in primary metals was the result of the closing of the Great Falls smelter and declines at other locations during 1972 and 1973, not a reflection of the recession. The 800 new workers in other manufacturing included small increases in a number of activities—among them chemicals, cement, and travel trailers.

Those high farm incomes and the stability of nonfarm basic employment had a startling effect on derivative employment: almost 35,000 new jobs—an increase of 19 percent—in four years:[7]

Derivative Employment, Montana

	1970	1974	Change
Total	180,600	215,300	34,700
Utilities (except railroads)	10,800	13,100	2,300
Construction	11,000	13,800	2,800
Trade	48,100	59,100	11,000
Services and finance	41,800	53,400	11,600
State and local government	40,700	45,200	4,500
All other	28,200	30,700	2,500

Two-thirds of the gain (almost 23,000 jobs) was in trade, services, and finance. Of these, about 6,000 were in motels, restaurants, and bars. You may have noticed that Colonel Sanders, McDonald's, and Sambo's all discovered Montana in the early seventies.

We think these employment figures are a little misleading. First of all, although the number of jobs has been increasing, the average hours worked per week has been declining significantly. This is especially true in the trade and service industries. If workers in those industries had been working the same number of hours on the average in 1974 that they were in 1970, there would have been almost 5,400 fewer workers. That would have meant only a

[7]Ibid.

little over 29,000 new derivative jobs rather than the 34,700 reported here. This is not happening nationwide; at the national level, there has been a slight decline in number of hours worked, but nothing like the decline in Montana.

So while we have a lot of new jobs in the state, a good many of them seem to be part-time jobs—jobs as waitresses, motel maids, and so forth.

There's another way of looking at the relationship between primary and derivative industries, and that is to look at the earnings of workers in each group of industries:[8]

Total Earnings, Montana (Millions of 1967 Dollars)

	1970	1974
Primary workers	709	817
Derivative workers	916	1,092
Ratio, derivative to primary	1.3	1.3

These figures represent total earnings—wages and salaries plus income of the self-employed—in primary industries and derivative industries. The interesting thing is that even though the number of derivative workers grew much more rapidly between 1970 and 1974 than did the number of primary workers, the relationship between the total earnings of the two groups stayed the same. That is, in both years, total earnings of workers in derivative industries were equal to about 1.3 times the earnings of primary workers.

In other words, the income multiplier effect of Montana's primary or basic industries has stayed just about the same even though the income generated is being divided among many more derivative workers. Obviously, this means a slower growth in income per derivative worker, and that's exactly what has happened.

Between 1970 and 1974, average earnings per year-round primary worker went up 15 percent in constant, 1967 dollars, while the average for derivative workers actually declined 1 percent after adjustment for price changes:[9]

Average Earnings, Montana (1967 Dollars)

	1970	1974	*Percent Change*
Primary workers	$8,235	$9,480	*15*
Derivative workers	5,118	5,072	*- 1*

[8]U.S. Department of Commerce, Bureau of Economic Analysis.
[9]Derived from U.S. Department of Commerce, Bureau of Economic Analysis and Montana Department of Labor and Industry, Employment Security Division data.

So what did happen in Montana between 1970 and 1974? Certainly we had a better record than we did in the fifties and sixties. Employment increased rapidly, mostly because farm income was high and nonfarm primary industries appeared to hold their own or even grow a little. We should recognize, however, that the increase in total employment may not be all it appears to be: a good share of the increase appears to represent more workers working fewer hours in jobs that don't pay very well.

Our per capita income moved closer to the national average, but the gains were due in part to high farm income, and farm income is very unreliable. A poor crop year in Montana or a price decline could wipe out those gains. We note also that the state's unemployment rate continued higher than the United States over the whole period. And finally, in spite of all the talk about population growth, we doubt that Montana's population really increased by 6 percent in four years. It's nothing unusual for the Census Bureau to overestimate Montana's population between census years. They did so in the fifties and the sixties.

While we have a lot of new jobs, many seem to be part-time and low-paying

We know that the proportion of Montana's population in the labor force has been growing rather rapidly because of all the young people born during the baby boom of the fifties who are now of working age, and because of the increasing numbers of women who are working. These increases in employment may have misled the Census Bureau: one of the data series it uses in making its yearly population estimates is nonfarm wage and salary workers.

If the population figure is too high, then of course that means that the per capita income estimates are too low, because per capita income is calculated by dividing total income by total population. So maybe Montana really didn't have a 6 percent increase in population between 1970 and 1974, and maybe our per capita and family incomes were a little higher than the figures show. Unfortunately, we probably won't know whether this theory is true until after the 1980 census. But it is an interpretation of recent events that has quite a lot of appeal. A good many Montanans would just

as soon population didn't grow, but most of us would like to see our incomes moving toward the national average.

There is one more thing we need to say about Montana between 1970 and 1974. The growth in population and employment which did occur wasn't spread evenly around the state. And we have a new candidate for the title "fastest growing city," replacing Missoula: Billings. Just over one-fourth of the new jobs created between 1970 and 1974 were in Yellowstone County. Another one-fourth were in the Bozeman and Missoula labor market areas. That is, together the two areas accounted for 25 percent.

The Bozeman area, as defined by the Montana Department of Labor, includes Gallatin, Meagher, and Park counties. The Missoula area includes Sanders, Mineral, Missoula, and Ravalli counties. I think it is safe to assume that most of the jobs were in Bozeman and Missoula.

These three areas, whose economies generated more than half the new jobs between 1970 and 1974, had only 31 percent of the state's population in 1970. Cascade County had a very respectable growth; it accounted for 8 percent of the new jobs during the four-year period. The Helena area, which includes Lewis and Clark, Broadwater, and Jefferson counties, accounted for 6 percent.

I've talked about the period from 1970 to 1974 because I wanted to discuss possible long-term changes in the direction of Montana's economy since 1970. But during the past two years we've had another influence to contend with—a national recession which has been the worst since the thirties. Montana, of course, is affected by national economic developments. We know that very well in western Montana, where changes in the national housing market have a great deal to do with our economic health, dependent as it is upon the wood products industry.

"Montana as a whole is not as susceptible to business cycles as are many other parts of the United States"

But Montana as a whole is not as susceptible to business cycles as are many other parts of the United States. A 1973 report by the U.S. Department of Commerce compared changes in nonfarm income in the fifty states during five post-World War II recessions. The authors found that Montana was one of the least cyclical of the states. Only two—North and South Dakota—showed more resistance to national business cycles.

The explanation is rather obvious—the states that suffer most during recession are those that are heavily dependent on manufacturing, especially durable goods manufacturing (automobiles, appliances, etc.).

Most of Montana, of course, still is predominately agricultural. Only western Montana is dependent upon manufacturing activity for a large part of its income. Even though it has been declining in importance for twenty-five years, agriculture still has more influence on Montana's total personal income than does any other activity.

The events of the past two years confirm this. High farm income in 1974, plus the lack of manufacturing activity in the state as a whole, kept Montana from feeling the recession the way many industrial areas did. We did not experience the decline in employment that occurred in the United States as a whole (figure 7).

In 1975, unemployment in the United States exceeded unemployment in Montana for the first time in twenty years or so—further evidence that the recession was less severe here (figure 8). Just the same, Montana's unemployment rate rose and hovered around 8 percent for most of 1975, and that is high enough.

Figure 9 was intended to compare income in Montana and the United States during the recession. Mostly it shows the influence of farm income on total income in Montana. The figures are seasonally adjusted, but they jump around quite a lot—due to the erratic nature of farm income. The chart does show that personal income in Montana fell further during 1974 and the first quarter of 1975 than it did in the United States, but it was falling from an unprecedented high. Even after the drop Montana was better off in comparison to the nation than during most of the past two decades. We don't have income figures for the last half of 1975, but we expect that Montana's total income for the year, in constant dollars, was lower than in 1974. We think that both farm and nonfarm income may have been down last year, after allowing for price increases.

Annual average employment figures often cover up fluctuations, but they do give us some idea of what happened to various state industries between 1974 and 1975. Total employment in Montana increased in 1975, but our primary industries had their problems. Every basic industry except federal government reported a decline in employment:[10]

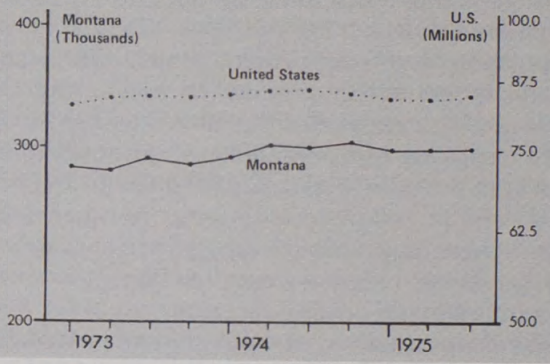
Primary Employment, Montana

	1974	1975	Change
Total	86,400	83,500	-2,900
Farm	35,100	34,100	-1,000
Nonfarm	51,300	49,400	-1,900
Mining	7,500	6,800	- 700
Manufacturing	24,300	22,200	-2,100
Railroads	6,500	6,100	- 400
Federal government	13,000	14,300	1,300

The effect of the depressed national housing market was felt here as manufacturing employment

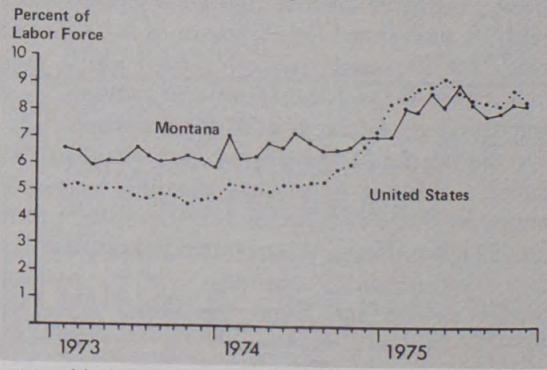
[10]Montana Department of Labor and Industry, Employment Security Division.

Figure 7
Employment in Montana and the United States, 1973-1975



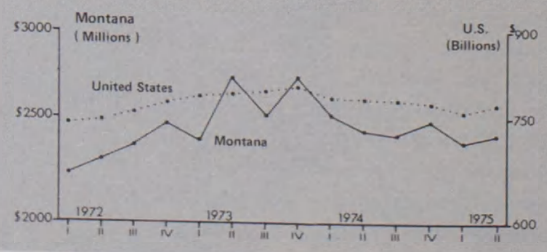
Quarterly figures, seasonally adjusted.
Sources: Montana Department of Labor and Industry, Employment Security Division and U.S. Department of Labor.

Figure 8
Unemployment in Montana and the United States, 1973-1975



Monthly figures, seasonally adjusted.
Sources: Montana Department of Labor and Industry, Employment Security Division and U.S. Department of Labor.

Figure 9
Total Income in Montana and the United States, 1972-1975



Quarterly figures, seasonally adjusted.
Source: U.S. Department of Commerce, Bureau of Economic Analysis.

fell by 2,100 workers—half of them in the wood products industry. Average yearly employment in mining was down 700 and still falling at the end of the year. As of November 1975, there were 2,500 metal miners employed in Montana, compared to an average of 4,100 in 1974. The decline is a result of cut backs in the open-pit operations and a phasing out of the underground mines. The Anaconda Company says it is losing money on its underground operations, and presumably the underground mines are being closed permanently.

Railroad employment declined by 400 between 1974 and 1975. So altogether we had a loss of 3,200 jobs in the private nonfarm export sector (in mining, manufacturing, and railroads). The gain of 1,300 in federal government helped off set the loss.

The decline in basic employment had its repercussions in the derivative industries:[11]

Derivative Employment, Montana

	1974	1975	Change
Total	215,300	221,600	6,300
Utilities (except railroads)	13,100	13,100	0
Construction	13,800	12,600	-1,200
Trade	59,100	59,300	200
Services and finance	53,400	55,000	1,600
State and local government	45,200	50,300	5,100
All other	30,700	31,300	600

The total number of derivative or secondary jobs increased again in 1975, but much more slowly than in other recent years. Wholesale and retail trade, which added 11,000 jobs between 1970 and 1974, added 200 jobs in 1975. The expansion in services and finance slowed too.

The 11 percent increase in government jobs between 1974 and 1975 more than offset the jobs lost in the private sector

Construction, which is very cyclical, declined by 1,200, mostly in heavy construction. Part of this decline was due to the near completion of Libby Dam.

The big influence in 1975 was the increase in state and local government employment—5,100 jobs in one year.

[11]Ibid.

If we add the 1,300 new federal jobs to the increase of 5,100 in state and local government, we have 6,400 new jobs in government in 1975:[12]

Total Employment, Montana

	1974	1975	Change
Total	301,700	305,100	3,400
Primary industries	86,400	83,500	-2,900
Derivative industries	215,300	221,600	6,300
Private industry	243,500	240,500	-3,000
Government	58,200	64,600	6,400

Those 6,400 jobs offset the loss of 3,000 in the private sector and accounted for the net increase of 3,400. They represent an 11 percent increase in government employment between 1974 and 1975. This compares to a 3.5 percent increase nationally. A year ago, we were talking about the slow growth of government employment, and I confess I was surprised to see this gain. I am told that much of it represents temporary employment funded by the federal government under CETA (Comprehensive Employment and Training Act). In any case, without the government jobs, we presumably would have had a much higher unemployment rate than we did last year. Increases of this size are not likely to occur this year.

Of course, the recession affected different areas in the state differently. Hardest hit was western Montana, with its dependence on manufacturing. According to the estimates, unemployment averaged 13 percent in the Kalispell labor market area and 11 percent in Missoula last year. The Butte-Anaconda area was hurt by mining layoffs and reported an average unemployment rate of 9.4 percent. Cascade County experienced an 8.0 percent unemployment rate, the Helena area 6.9 percent. The state figure was 8 percent.

In eastern Montana, rates of from 5 to 5.5 percent were common. The prices of wheat and cattle and the increasing costs of farm production were of far more concern there.

§

So Montana begins 1976 with high employment, high unemployment, and real incomes down from the highs of 1973. Let's speculate a bit about what the rest of the year may bring us.

We may as well recognize first of all that whatever one says about Montana's prospects can be contradicted by a poor crop year, or an

[12]Ibid.

unusually good one, or by an unexpected change in wheat prices because of something that happens somewhere else in the world.

But for this discussion let's assume that farm income continues near its recent (1974-1975) levels. In reading U.S. Department of Agriculture reports, I gather it believes that cattle prices may stay about the same this year, or increase a little. Wheat prices, nearly everyone agrees, depend nowadays on what happens to the world supply. Unless another severe shortage develops, however, we don't expect wheat prices to return to those extraordinary 1973 levels.

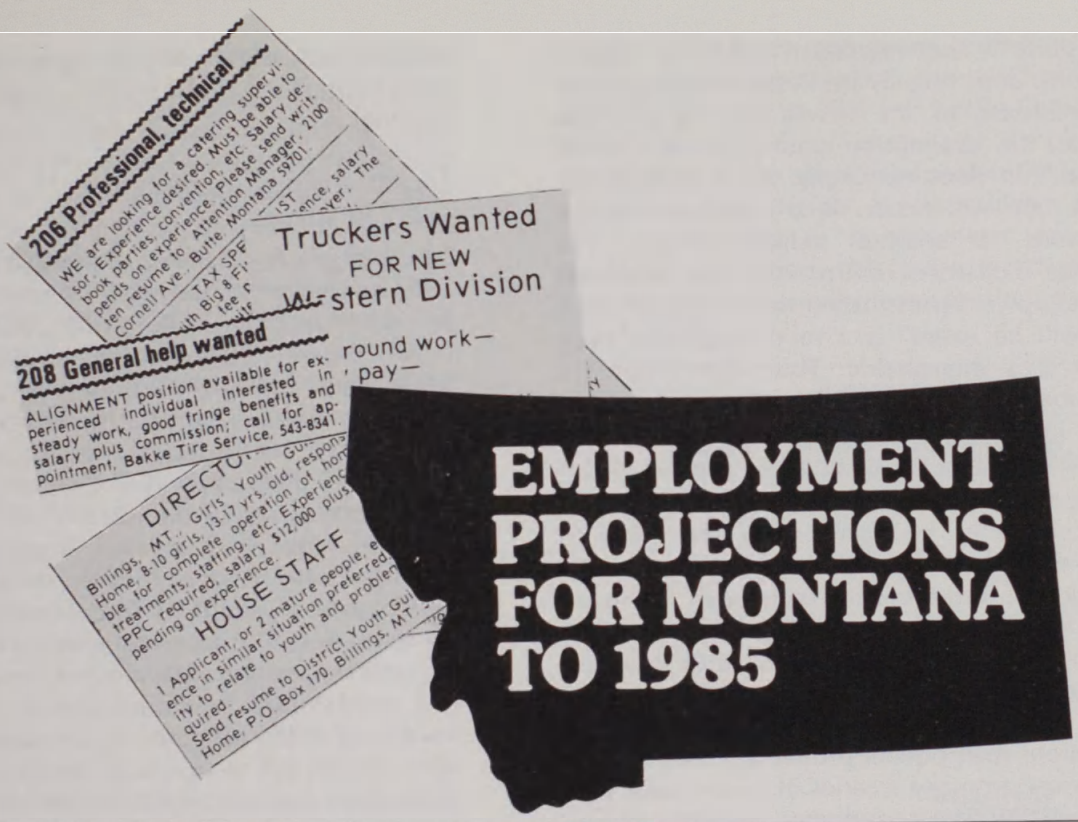
A standard middle-of-the-road forecast for the U.S. economy in 1976 seems to call for around a 5 percent increase in real gross national product (after adjusting for price changes). The consumer price index is expected to increase around 6 or 7 percent, with unemployment remaining high, probably averaging above 7 percent. In other words, our problems aren't going to disappear rapidly, but we should have a modest improvement in the U.S. economy this year.

We hope that improvement will mean an increased demand for Montana products. The consensus on the housing market seems to be for an increase from 1.1 million starts last year to 1.5 million or so this year. That does not promise a very good year, but it is an increase of 35 or 40 percent over 1975. If such an increase develops, it should put some western Montana mills back on a full schedule.

We would hope that increased industrial production at the national level might also put some other manufacturing workers, as well as some metal miners and railroad employees, back to work. I think we need to realize, however, that some of the declines in mining employment which occurred during the recession may be permanent. Underground mining may be a thing of the past in Butte.

So we hope for some improvement in 1976, especially in western Montana where the recession has done the most damage.

But to me the big question of the mid-seventies is not the timing of the recovery from the recession, but how Montana will do during the rest of the decade. If it is true that the state's economy has begun to perform better, can it continue to do so? Where will we be in 1980? Paul Polzin looks at projections for 1980 and 1985 in the following presentation. □



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"The economic well-being of Montanans will continue to improve, but at a rate far behind the rest of the nation"

The reputation of economists has suffered in recent years due to their apparent inability to anticipate future economic trends. Newspapers often quote respected economists as stating something is certain to happen—for example, "there will be no recession," "inflation is coming to an end"—only to have them contradicted by the actual events. This track record seriously impairs the credibility of economists and throws doubt on the usefulness of examining future trends in Montana's economy.

To a large extent, the loss of faith in economists is due to a misunderstanding by the public of economic projections, one of the basic tools of economic analysis. Also, some of the blame must be placed on economists who make off-the-cuff remarks without precisely defining their statements.

The logic behind economic projections

Economic projections consist of two essential parts: the underlying assumptions and the conclusion. Essentially, they may be viewed as "if-then" statements. One example of a projection is "if the interest rate falls (the assumption) then home building will increase (the conclusion)," or "if the price of copper rises (the assumption) then Anaconda will hire more workers (the

conclusion)." The important point is that a projection does not, by itself, say anything about the likelihood of the event. In the previous example, the assumption states, "if the interest rates fall"; it does not imply that a drop in the interest rate will occur. It is legitimate to use projections to analyze unlikely events. For example, "if oil prices return to their previous level then the upward pressure on the consumer price index will be eased" is a valid projection even though it is improbable. Thus, the user of a projection must keep the underlying assumptions firmly in mind and the economist should specifically outline the assumptions he has made.

If an economist believes his assumptions are realistic—that is, he thinks they are likely to occur—then he may use his projection as a prediction of future events. Technically, these are called forecasts. The basic difference between projections and forecasts is that the latter includes, sometimes implicitly, an assessment of the realism of the assumption. If a number of alternative assumptions seem equally probable, the economist may choose to make a series of projections, with one projection corresponding to each assumption. A good example of this procedure will be shown later when the future population of Montana is discussed.

All of this may appear unnecessarily complicated to the layman who only wants a rough idea of future economic trends; he must first ferret out the underlying assumptions and then evaluate their realism. But, the real world—especially the world of economics—is not simple or easy to generalize. Economic projections are a very powerful and useful analytical device. They must, however, be used carefully because they may be easily misinterpreted.

The complexities of the assumptions underlying projections are, in fact, one of the strong points of this analytical method. For example, a projection need not be rejected simply because one or two of the assumptions are deemed inappropriate. Rather, these assumptions may be modified and a new projection derived with only a minimum expenditure of time and effort. This feature will be utilized when we examine the projections for Montana.

This lengthy discourse concerning the logic behind economic projections and their correct interpretation is not mere nitpicking. The following pages present projections which have some very important implications for Montana's economy. It is crucial that the rules are carefully spelled out in advance so there will be no confusion or misinterpretation of the findings or the underlying motivations.

Explanation of projections used in this study

Four sets of projections for Montana's population and employment during 1980 and 1985 are presented in table 1. Before discussing them in detail, some information concerning their background and origin is presented.

OBERS is an acronym for the Office of Business Economics (now the Bureau of Economic Analysis) of the U.S. Department of Commerce and the Economic Research Service of the U.S. Department of Agriculture, the two federal agencies which were primarily responsible for their derivation. OBERS provides a series of coordinated projections for the nation, all states, and selected multicounty regions, computed with alternative assumptions and standardized methodologies. Its projections have been widely accepted by various government agencies and private users. Essentially, the OBERS projections are extrapolations of trends as they existed during the late sixties and early seventies, supplemented with certain key assumptions.

The NPA projections are prepared by the National Planning Association of Washington, D.C. They are similar to OBERS in that they consist of a coordinated set of projections for the nation and all states. The major difference between the NPA and OBERS is in certain assumptions about the national economy—for example, in the change in labor productivity and possible federal tax reforms—and in the manner in which economic growth is distributed among the various geographic areas.

The Montana Economic Study was conducted by the Bureau of Business and Economic Research at the University of Montana in Missoula. It has been widely accepted and quoted in Montana.

There are advantages and disadvantages to each set of projections. Both OBERS and NPA view the various geographic regions as interdependent; events in one area of the country are taken into account in the projections for other regions. On the negative side, the use of a single projection methodology implies that unique aspects of individual states or regions cannot be easily incorporated. The projections of the Montana Economic Study were derived within the framework of national projections but were not integrated with projections for other areas or states. These are the only projections done by Montanans and tailored to the state's economy.

How the various sets of projections differ

Looking first at population, the upper portion of table 1 presents three projections for Montana. (The National Planning Association does not publish population projections for states.) It takes only a quick glance at these figures to see significant differences. OBERS "C" and the Montana Economic Study project a population of 720,000 to 725,000 in 1980. The OBERS "E" projections, however, are more than 50,000 lower, at 669,700 residents in 1980. This provides a dramatic example of the effect of differences in the underlying assumptions. The two OBERS projections are essentially identical except for the birth rates.[1] The "E" series takes account of recent events and assumes a rapid decrease in births toward the net reproduction rate; the fact that they show a decline from the 1970 level of population has received much publicity. The "C" series uses a much higher birth rate, approximating the experiences during much of the sixties. The Montana Economic Study did not make explicit assumptions about birth rates. The effect of its methodology was to extrapolate the trends of the sixties, which results in its figures approximating series "E".

The dissimilarity between these projections is simply due to the differences in the number of births between 1970 and 1980. Demographers and other social scientists are not certain if current events represent a change in the long-run trend. Some argue that the low birth rates will continue, while others predict a return to a higher number of births. This difference of opinion provides a good example of projections using alternative assumptions. Rather than attempting to predict whether higher or lower birth rates are more likely, two sets of projections were made. Provided he knows the underlying assumptions, the user may then decide which he prefers.

Population projections vs. employment projections

Population projections are fascinating and interesting; indeed, they are often considered newsworthy and receive considerable public attention. But, as was just shown, a change in one assumption can make a significant difference. Further, in the medium long-run—ten or fifteen years in the future—population projections really say very little concerning the economic health of an area. Those born in 1970 will not be looking for work before 1987, or even later. Employment projections, on the other hand, reflect the ability of a region to provide jobs for its residents and are often interpreted as a barometer of overall economic conditions. The four sets of figures for Montana are shown in the lower portion of table 1.

Table 1

Alternative Projections of Population and Employment in Montana 1980 and 1985

	1970 (Actual)	1980	1985
		Population	
OBERS "C"	694,409	720,000	NA
OBERS "E"	694,409	669,700	667,100
Montana Economic Study	694,409	725,000	NA
NPA	694,409	NA	NA
		Employment	
OBERS "C"	254,088	262,500	NA
OBERS "E"	254,088	269,700	270,300
Montana Economic Study[1]	254,088	277,600	NA
NPA[1]	254,088	304,200	319,600

NA = not available.

[1]Adjusted to be comparable with OBERS.

Sources: [1970] U.S. Bureau of the Census, *Census of Population: 1970*, Vol. 1, *Characteristics of the Population*, Part 28, Montana (Washington, D.C.: Government Printing Office), tables 16 and 53. Employment includes persons 14 years old and older. [OBERS "C"] *1972 OBERS Projections, Series "C,"* Vol. 5 (Washington, D.C.: U.S. Water Resources Council, 1972), pp. 112-115. [OBERS "E"] *1972 OBERS Projections, Series "E,"* Vol. 4 (Washington, D.C.: U.S. Water Resources Council, 1972), pp. 82-84. [NPA] Joe Won Lee and William B.D. Hong, *Regional Economic Projections: 1960-1985*, Report No. 73-R-1 (Washington, D.C.: National Planning Association, 1973), p. 563. [Montana Economic Study] *Research Report of the Montana Economic Study*, Vol. 2 (Missoula: Bureau of Business and Economic Research, University of Montana, 1970), p. 4.14.

Before examining the implications in detail, I would like to discuss the two OBERS projections. The "C" series projects 1980 employment to be 262,500, while the corresponding figure in the "E" series is 269,700, a difference of about 7,000 workers. These two values are in sharp contrast to the population projections, which differed by 50,000. Notice, also, that the "E" employment projection is slightly larger. This is an example of

[1]There are a few other minor differences, dealing mostly with assumptions concerning changes in the national economy. See *1972 OBERS Projections, Series "E,"* Vol. I (Washington, D.C.: U.S. Water Resources Council, 1974), p. iii.

the possible misconceptions which can be obtained by looking only at population projections. Specifically, series "E" projects more jobs for Montanans despite the declining population.

Differences among the employment projections

It requires only a quick glance at the four employment projections to detect significant differences among them.[2] The two OBERS projections are the lowest, with values of 262,000 to 269,700 for 1980 and 270,300 for 1985; the NPA projections, 304,200 in 1980 and 319,600 in 1985, are the highest; and the Montana Economic Study, 277,600 in 1970, falls in between. A detailed examination revealed that these projections were based on dissimilar assumptions; if they are standardized, the differences are greatly reduced.

"Employment projections reflect the ability of a region to provide jobs for its residents and are often interpreted as a barometer of overall economic conditions"

The OBERS projections are based on trends as they existed in the 1960's and very early 1970's. This period provides an acceptable foundation for projections because, with one major exception, conditions in Montana have not changed significantly in the last five years. The exception is, of course, coal development; the OBERS projections do not include the employment directly and indirectly associated with increased extraction and processing of Montana coal. If these workers are added to OBERS, the resulting employment projections more accurately reflect trends as they currently exist.[3]

A recent study concluded that coal development will directly and indirectly increase employment by

5,000 to 7,500 in 1980 and 6,000 to 10,600 in 1985.[4] If the higher figures are added to the OBERS "E" projections, the resulting values are 277,200 for 1980 and 280,900 in 1985. (Using OBERS "C" leads to a projection for total employment of 270,000 in 1980.)

The NPA projections, on the other hand, are probably too high. Specifically, their assumptions concerning employment in agriculture, wood products, and government appear somewhat optimistic in light of current events.

NPA projects that agricultural employment in Montana will grow from 26,800 in 1970 to 32,100 in 1985 and to 32,400 in 1985.[5] This represents a complete reversal of the 1950-1970 trend that saw agricultural employment decline by almost one-third. As shown earlier, employment on Montana's farms and ranches has more or less stabilized since 1970, but this may be only a short-run reaction to the recent prosperity in agriculture. The past trends

[2]The employment figures in table 1 have been adjusted so they are comparable because the published projections used different definitions. This involved converting the *Montana Economic Study* and NPA projections to the U.S. Bureau of the Census's concept of employment used by OBERS. Essentially, this eliminates the double counting due to multiple job holders and the use of an April reporting date. The employment figures in table 1 are not comparable to those reported by Maxine Johnson in the previous article.

[3]In fact, the OBERS projections were used in precisely this manner to estimate the potential impact of coal development. See Paul E. Polzin, *Water Use and Coal Development in Eastern Montana* (Missoula: Bureau of Business and Economic Research, University of Montana, 1974), pp. 114-126.

[4]Ibid., pp. 108-117. These figures have been adjusted to eliminate multiple job holders.

[5]Joe Won Lee and William B. D. Hong, *Regional Economic Projections: 1960-1985*, Report No. 3 (Washington, D.C.: National Planning Association, 1973), p. 563.

toward increased mechanization and consolidation, combined with the fact that the average age of Montana farm and ranch operators is 50 years, suggest that it is unlikely that farm employment will increase.[6] Taking an optimistic view and assuming farm employment stabilizes at its 1970 level, we suggest that the NPA projections are about 6,000 employees too high in 1980 and 1985.

Wood products employment in Montana is projected by NPA to grow from 9,100 in 1970 to 13,300 and 14,000 in 1980 and 1985, respectively. Future developments in this industry are difficult to evaluate because they depend on the business cycle, events in other wood producing regions, and decisions made by the U.S. Forest Service. There is currently much debate concerning harvesting practices on Montana's forest land. Even though no definite conclusions have been reached, significant increases in timber removals on a sustained basis appear rather unlikely.[7] Further, some experts believe that Montana may lose some of its competitive advantage to other timber growing regions in the United States, especially the South, and that the harvesting of roundwood from Montana's forests may actually decline during the next thirty years.[8] Taking the middle ground and assuming wood products employment will increase to about 11,000 suggests the NPA total employment figures are an additional 2,000 to 3,000 workers too high in 1980 and 1985, respectively.

The final area of disagreement, and the one with the greatest potential error, concerns NPA's projection of government employment. In 1970, NPA reported 53,500 persons in Montana working for the federal, state, and local governments. By 1980, it projects an increase to 77,300 and then a further rise to 86,600 in 1985. This growth is possible, but not very probable.[9] State and local government employment did grow at approximately the projected rate during part of the sixties, and Maxine Johnson has reported a sharp increase during 1974 and 1975. There is good reason to believe, however, that future employment growth at all levels of government will be much more moderate. There is currently strong political pressure to hold down the increases in government costs. This surely will be reflected in a more moderate growth in number of new employees. Further, much of state and local government employment is concerned with education, and the rapid increase in this sector during the past decades was probably due to rapidly rising enrollments caused by the post-war baby boom. There has been a drop in birth rates and this should moderate the long-run demands for additional facilities. Finally, I think the recent rise in state and local employment represents a short-run phenomenon primarily attributable to federal government contra-cycle policies. If it is assumed that government employment in Montana grows at the rate experienced between 1970 and 1974 (refer to Maxine's 1970 to 1974 table) the revised figures would be about 66,000 in 1980 and 75,000 in 1985, about 11,000 and 12,000 below those projected by NPA.

It is difficult to determine the exact assumption NPA made concerning coal development in Montana. It does project coal mining employment to increase by 800 workers between 1970 and 1980, with an additional 300 workers by 1985. This is approximately equal to the projections in a recent study.[10] Thus, it appears safe to assume that the NPA projections of total employment do include significant increases in coal-related activities.

After changing the assumptions with respect to agriculture, wood products, and government, the NPA projections are about 23,000 and 27,000 workers too high in 1980 and 1985. These totals are slightly greater than the sum of the individual industry adjustments because agriculture, wood products, and the federal government are basic industries; altering their employment requires further changes in derivative employment. Subtracting these totals from those shown in table 1 leads to revised employment projections of 281,200 and 292,600 for 1980 and 1985, respectively.

The *Montana Economic Study* did not anticipate the magnitude of likely coal development.[11] On the other hand, it appears to have overestimated the decline in agriculture and was, perhaps, too optimistic about metal mining. These errors tend to

[6]U.S. Bureau of the Census, *Census of Agriculture, 1969*, Vol. 1, *Area Reports*, Part 38, Montana, Section 2, County Data (Washington, D.C.: Government Printing Office, 1972), p. 1.

[7]Dennis L. Schweitzer, Robert E. Benson, and Richard J. McConne, *A Descriptive Analysis of Montana's Forest Resources*, U.S. Department of Agriculture Forest Service Resource Bulletin INT-11 (Ogden, Utah: Intermountain Range and Experiment Station, 1975), pp. 21-25.

[8]D. L. Holly, "Location of the Softwood Plywood and Lumber Industries," *Land Economics*, May 1970, pp. 127-137. *1972 OBERS Projections, Series "E,"* Vol. I, p. 106.

[9]The excessively high rate of growth projected by NPA has been criticized elsewhere. See *Research Report of the Montana Economic Study* (Missoula: Bureau of Business and Economic Research, University of Montana, 1970), pp. 431-432.

[10]Polzin, *Water Use and Coal Development in Eastern Montana*, pp. 108 and 113.

[11]*Research Report of the Montana Economic Study*, pp. 4.13-4.33.

counterbalance each other and reduce the discrepancy in the projection for total employment.

After standardizing the assumptions, the four employment projections are remarkably close. The revised figures for OBERS Series "E" are 277,200 in 1980 and 280,900 in 1985. (The corresponding Series "C" projection for 1980 is 270,000.) The NPA projections are still higher, 285,200 in 1980 and 292,600 in 1985, but the differences between them and OBERS have been reduced. The *Montana Economic Study*, projecting 1980 employment at 277,600, still holds an intermediate position.

Many more workers than jobs likely in 1985

Employment projections do not tell the whole story. They provide a rough idea of the number of jobs that will be available in Montana, but they say nothing about the number of persons available for work. The postwar baby crop has grown out of diapers and is entering the labor force in increasing numbers. Based on the 1970 census, roughly 151,000 young Montanans will enter the prime employment age groups between 1970 and 1980. At the same time, only about 55,000 persons will reach retirement age. This phenomenon is often called the "natural increase" in the labor force and implies that Montana must have growing employment opportunities simply to provide jobs for those persons already living here.

A rough idea of the potential labor market pressures may be obtained by "aging" the 1970 population forward and applying projected participation rates to derive the expected number of persons in the labor force.[12] Since those born after 1970 would not normally be looking for jobs earlier than 1985, no assumptions are made concerning future trends in the birth rate. This procedure is not designed to accurately describe Montana's future labor force. By 1980 or 1985, many persons living in Montana during 1970 may have left; to some extent, they may be replaced by others with dissimilar characteristics. Rather, this method provides an indicator of the potential increase in the labor force due only to persons already living in Montana.

The potential labor force for 1980 and 1985 based on Montana's 1970 population is presented in the upper portion of table 2. These figures show the labor force growing from 268,800 in 1970 to 321,900 in 1980 and to 342,100 in 1985. This increase is due not only to a heavy concentration of young persons, but also to the projected changes in the participation of certain age-sex cohorts; for example, women have an increased propensity to look for jobs outside the home. Assuming a 6 percent unemployment rate, roughly equal to Montana's experience between 1970 and 1974, employed workers will number 302,600 in 1980 and 321,600 in 1985.

Table 2

Potential Labor Force, Revised Employment Projections, and Potential "Job Gap" in Montana 1980 and 1985

	Potential Labor Force and Employed Persons		
	1970 (Actual)	1980	1985
Labor Force	268,800	321,900	342,100
Unemployment (at 6 percent)	—	19,300	20,500
Employed persons	—	302,600	321,600
	Revised Employment Projections[1]		
	1970 (Actual)	1980	1985
OBERS "C"	254,088	270,000	NA
OBERS "E"	254,088	277,200	280,900
Montana Economic Study	254,088	277,600	NA
NPA	254,088	285,200	292,600
	Potential "Job Gap"		
Maximum[2]		25,400	40,700
Minimum[3]		17,400	29,000

[1]Assumptions have been standardized. See text.
[2]Using OBERS "E" Employment Projections.
[3]Using NPA Employment Projections.

The potential labor force and the number of employed workers may be used to place the projections in proper perspective. The revised employment projections are presented in the center portion of table 2. They show, for example, that employment will be between 277,200 and 285,200 in 1985—ignoring the OBERS "C" projection because there is no corresponding value for 1985. On the other hand, there is the

[12]Age-sex participation rates for 1980 and 1985 have been projected in the following source: Denis F. Johnson, "The U.S. Labor Force: Projections to 1990," *Monthly Labor Review*, July 1973, pp. 3-14. Montana's participation rates have often been lower than the national average. Consequently, the published figures have been adjusted downward in light of the participation rates reported in U.S. Bureau of the Census, *Census of Population: 1970, Detail Characteristics*, Final Report PC(1)-D28, Montana (Washington, D.C.: Government Printing Office, 1972), table 164.

potential for 302,600 employed persons. This implies a "job gap"—an excess of persons available for work over the number of positions, even after allowing for 6 percent unemployment—of between 17,400 and 25,400. Similar calculations for 1985 suggest that the "job gap" will grow to between 29,000 and 40,700.

What do all these numbers mean? They should not be interpreted as a prediction. In fact, they actually describe an impossible situation because modifying forces will have been at work long before 1980. Rather, they imply that the projected increase in the number of jobs, which includes significant coal development, will fall far short of the number of Montanans who would be available for work. In other words, Montana's economy is not projected to create sufficient jobs for those who are already here (or were here in 1970).

The job gap means continued outmigration

A major implication of these calculations is for continued net outmigration in the 1970s and 1980s as Montanans are forced to leave in search of jobs. It is very difficult to project reliably the number of migrants; as Maxine stated earlier, people move for many reasons and only some of these are related to employment. Further, even among those motivated by the job market, there is no precise relationship between the number of migrants and number of job openings. A very rough "ballpark" figure can be obtained by assuming that there will be two persons associated with every job.[13] In this case, the implied net outmigration (this is the excess of those leaving over those moving in) is 34,800 to 50,800 from 1970 to 1980, with an additional 23,200 to 30,600 during the five years from 1980 to 1985. The maximum figure for the seventies is slightly less than net outmigration during the sixties, and that for the eighties is only marginally greater (assuming the trend would continue throughout the decade). Consequently, I think it is safe to conclude that although net outmigration will occur for the period as a whole, it will probably be less severe than during the sixties.

Relative decline in Montana's per capita income likely to continue

This analysis has emphasized projected labor market conditions and the continued outmigration of Montanans in search of jobs. But, what about those who remain? Maxine earlier used per capita personal income to measure the economic well-being of residents. This is not a perfect measure, equating well-being with money income, but it is easily understood and appropriate data are readily available.

Alternative projections for Montana's per capita income, converted to constant 1958 dollars to eliminate the effect of inflation, are shown in table 3. The NPA and OBERS "E" use slightly different 1970 per capita incomes because the projections were not made at the same time and income estimates are periodically revised. Figures for 1968 are presented for the Montana Economic Study and OBERS "C" because they were prepared before 1970 data were available. (There apparently were minor differences even in the 1968 values.)

Table 3

Per Capita Personal Income, Actual and Projected Montana, 1970, 1980, and 1985

(In constant 1958 dollars)

	1970	1980	1985
OBERS "C"	2,460[1]	3,590	NA
Percent of U.S.	*85*[1]	*86*	
OBERS "E"	2,650	3,670	4,200
Percent of U.S.	*87*	*88*	*89*
Montana Economic Study	2,470[1]	3,330	NA
Percent of U.S.	*86*[1]	*79*	
NPA	2,660	3,800	4,480
Percent of U.S.	*88*	*86*	*83*

[1]Per capita income for 1968.

Per capita income projections have not been adjusted for differences in underlying assumptions.

Sources: [OBERS "C"] *1972 OBERS Projections, Series "C,"* Vol. 5 (Washington, D.C.: U.S. Water Resources Council), pp. 112-115. [OBERS "E"] *1972 OBERS Projections, Series "E,"* Vol. 4 (Washington, D.C.: U.S. Water Resources Council, 1974), pp. 82-84. [Montana Economic Study] *Research Report of the Montana Economic Study,* Vol. 2 (Missoula: Bureau of Business and Economic Research, University of Montana, 1970), p. 4.41. [NPA] Joe Won Lee and William B.D. Hong, *Regional Economic Projections, 1960-1985,* Report No. 73-R-1 (Washington, D.C.: National Planning Association, 1973), p. 57.

There is considerable variation among the alternative projections of per capita income in 1980. They range from a low of $3,330 for the *Montana Economic Study* to $3,800 for NPA. Differences in the level of per capita income may be due to dissimilar assumptions about the change in wages, population, and other factors. (They correspond to the unadjusted employment projections in table 1.) Rather than detailing these

[13]This is an aggregate participation rate of .50, not unreasonable in light of the fact that a greater than proportionate share of migrants tend to be in the prime working groups.

differences, an overview concerning the trends can be obtained by comparing the Montana incomes to the average for the United States. This identifies whether or not the well-being of Montanans is projected to increase or decrease relative to the average for the nation. Notice that there are differences among alternatives in the projected per capita income for the United States.

The four alternatives are evenly divided in their opinions concerning the relative trend of Montana's per capita income. OBERS "C" and "E" both project per capita income to grow slightly faster in Montana than in the United States. For example, OBERS "E" reported Montana's 1970 per capita income to be 87 percent of the nationwide average, and this percentage is projected to rise to 88 percent and 89 percent in 1980 and 1985, respectively. On the other hand, the *Montana Economic Study* and NPA project a relative decline in Montana's per capita income.

On the surface the projections appear to be in serious conflict, but the OBERS projection methodology contains a feature which almost assures that a state's per capita income will converge toward the national average.[14] Thus, the important point is not that Montana's income is projected to increase faster than the nation's—this is an integral part of the methodology; the point is the rate at which Montana's figure approaches that of the United States. Both OBERS projections foresee a slow convergence toward the national average of only one percentage point from 1970 to 1980 and one more point between 1980 and 1985.

These projections do not paint a very rosy picture for Montanans. At best, their economic well-being may improve slightly relative to the rest of the nation—this is primarily an assumption, not a conclusion, of the projection. At worst, the relative decline of the past decades will continue so that per capita income will be nearly 20 percent below the national average by 1985. The economic well-being of Montanans will continue to improve, but at a rate far behind the rest of the nation.

What can be done to halt, or at least retard, the relative decline in Montana's per capita income? This is not an easy question to answer. It is a problem which Montanans will have to address during the coming decades. The only real advice that can be given is that undue emphasis should not

be placed only on the quantity of new jobs; the quality of these positions is also important. Earlier, in computing the potential "job gap," no mention was made of the pay of the new positions. Technically, any additional positions could help to fill this void. If economic well-being is a criterion, however, new low-paying and seasonal jobs—such as those often associated with the tourist industry—are definitely not very attractive. The ideal form of employment would be stable positions in industries paying above-average wages. They would simultaneously reduce the "job gap" and help to moderate the relative decline in economic well-being.

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In summary, what do these projections say about Montana's economy during the coming five or ten years? First of all, Montana will certainly not be standing still. Total employment will grow by 27,000 to 39,000 from 1970 to 1985, depending on which projection we choose. Further, per capita income will rise between 55 and 65 percent during the same period. These figures have been corrected for inflation and represent a significant improvement in the economic well-being of the average Montanan.

On the other hand, the projected increase in employment will not be sufficient to provide jobs for all Montanans who would like to work. This will probably lead to continued net outmigration, which may, however, be less severe than during the sixties. Finally, the projections suggest that the rise in Montana's per capita income will be less than the national average and that Montanans will not reap the benefits to the same degree as people elsewhere in the nation.

Before closing, I would like to point out that these projections put coal development —currently one of the most talked-about topics in the state—into perspective. Keep in mind that the revised assumptions for the employment projections include significant coal-related activity. Yet, coal development will not have much impact on the state as a whole. Most of the new jobs will be in eastern Montana. In short, coal development will not be sufficient, by itself, to turn the state around. □

[14]OBERS projections assume the earnings per worker in the individual industries at the national level will converge toward the all-industry rate. This implies the gradual elimination of the "industry-mix" effect as a cause of spatial differences in per capita income. See *1972 OBERS Projections, Series "E,"* p. iii.

THE WOOD PRODUCTS INDUSTRY: A LOOK INTO THE FUTURE

MAXINE C. JOHNSON

Montana is a very large state geographically. When we talk in terms of total state figures, we cover up some important differences among different parts of the state. This discussion concentrates on western Montana. I shall look at the area mostly in terms of its major industry —wood products—because what happens to the wood products industry in western Montana has a very great effect on this area's economy. In defining the industry, I include the paper mill in Missoula. Pulp and paper and wood products share a common resource base and each is dependent on the other.

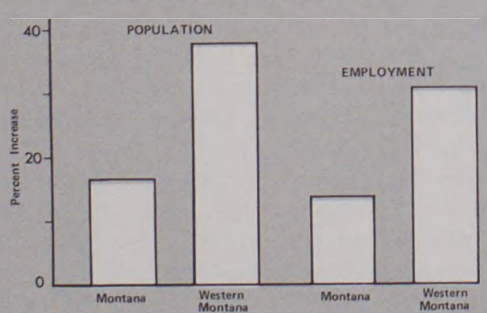
First, let's look briefly at what happened to western Montana between 1950 and 1970, and compare it to the state as a whole (figure 1). The population increase in Montana over those two decades was very modest—about 17 percent. But in eight western Montana counties—Flathead, Granite, Lake, Lincoln, Mineral, Missoula, Ravalli, and Sanders—there were 38 percent more people in 1970 than in 1950. Over half the increase in population occurred in Missoula County. Employment in all of Montana was up 14 percent between 1950 and 1970; in western Montana it increased 31 percent. Seventy percent of the new jobs in western Montana were in Missoula.

Total personal income (deflated for changes in price levels) increased 57 percent in Montana and 68 percent in our eight counties. And per capita income was up 34 percent in the state and 43 percent in western Montana (figure 2).

So western Montana's economy performed quite a lot better than the state economy between 1950 and 1970. Actually, most of the gains in western Montana occurred during the sixties—not much change occurred between 1950 and 1960.

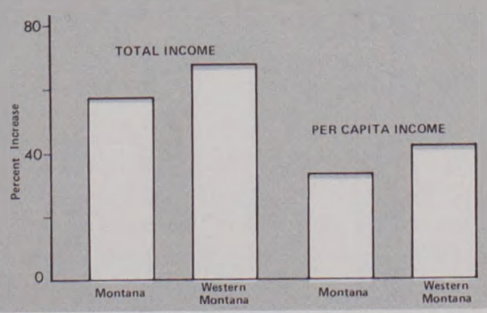
And we should note also that not all of the increase during the sixties represents a permanent gain. In 1970, Libby Dam was under construction up in Lincoln County; now that it is completed, population and employment have declined there. Nevertheless, the western Montana economy created quite a respectable number of new jobs, especially between 1960 and 1970, and individual incomes grew rather rapidly.

Figure 1
Changes in Population and Employment, Montana and Western Montana, 1950-1970



Western Montana includes Flathead, Granite, Lake, Lincoln, Mineral, Missoula, Ravalli, and Sanders counties.
Source: U.S. Bureau of the Census, *Census of Population, 1950 and 1970.*

Figure 2
Changes in Total and Per Capita Income, Montana and Western Montana, 1950-1970



See figure 1 for list of western Montana counties.
Source: U.S. Department of Commerce, Bureau of Economic Analysis, Regional Economics Information System.

It was mostly wood products that provided fuel for the economy. We talked earlier about Montana's primary industries, those industries which sell goods and services outside the state and thereby provide the basis for growth, or the lack of it: agriculture, manufacturing (including wood products), mining, railroads, and the federal government. Most of these industries reduced their employment in western Montana during the fifties and sixties:[1]

Changes in Employment
Western Montana
1950-1970

Total	12,350
Primary industries	– 450
Agriculture, forestry and fisheries	– 3,200
Manufacturing, total	3,900
Wood products and paper	2,500
Aluminum	1,000
Mining	– 50
Railroads	– 1,100
Derivative industries	12,800

People were leaving the area's farms and ranches by the hundreds. Some 3,200 fewer persons were employed in agriculture in 1970 than in 1950. (The number is probably larger because the category includes forestry workers, and they increased in number.) Railroads were laying off workers. The loss in railroad jobs in the eight counties amounted to almost 1,100 over the twenty years. What kept us going was the wood products industry, which added 1,500 workers, and the aluminum plant in Columbia Falls, which was completed in 1955 and which employed about 1,000 people in 1970.

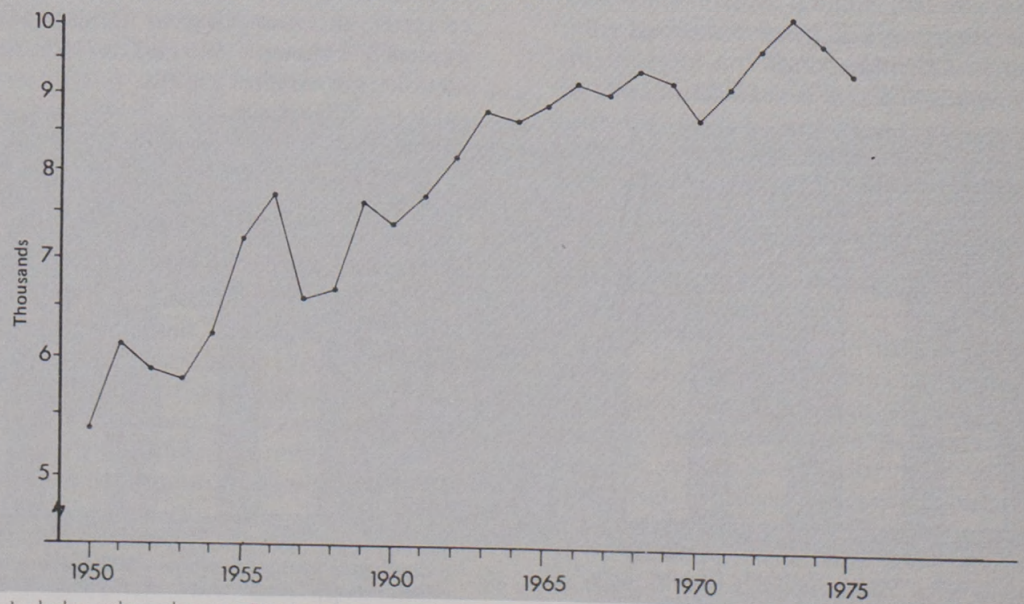
The 1970 figure understates the growth in wood products because 1970 wasn't a very good year. Figure 3, which shows total state employment in the industry from 1950 through 1975, gives a better indication of the long-term growth.

Federal government employment is missing from the table shown to the left. That's because these are census figures, and the census doesn't distinguish among federal, state, and local government employment. The census does distribute government employment by industry, so changes in Forest Service employment are incorporated in agriculture, forestry, and fisheries. I remarked earlier that increases in forestry employment no doubt offset some of the loss in agricultural employment.

Overall we think federal employment increased over the two decades, especially during the sixties—probably enough to offset the small

[1]Source: Montana Department of Labor and Industry, Employment Security Division. See figure 1 for list of western Montana counties.

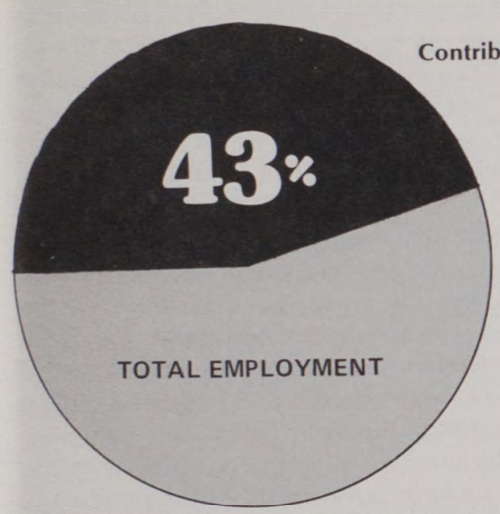
Figure 3
Wood Products Employment in Montana, 1950-1975

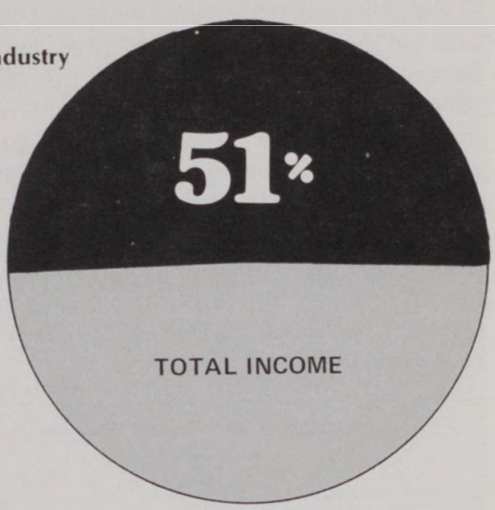


Includes pulp and paper. Ratio scale.
Source: Montana Department of Labor and Industry, Employment Security Division.

Figure 4

Contribution of the Wood Products Industry to Western Montana, 1969





Includes direct and indirect contribution.
Source: Maxine C. Johnson, "Wood Products in Montana," *Montana Business Quarterly*, Spring 1972.

decline of 450 shown here for total primary employment.

So while primary or basic employment was declining rather substantially in the state as a whole, it was pretty much holding steady in western Montana, thanks largely to wood products. We think this explains why the area was able to increase its total employment and income at a considerably faster rate than the rest of the state. One other primary activity, difficult to measure, which no doubt played a role, was the tourist industry.

By the end of the 1960s, western Montana had become heavily dependent on forest products. From 1966 through 1969, average annual employment in the industry statewide ranged from 9,000 to 9,400. About 90 percent of this employment was in western Montana. In a report which I prepared several years ago, I found that in 1969 approximately 43 percent of total employment in the eight western counties was either directly or indirectly attributable to the wood products industry (figure 4). That is, 43 percent of the people employed were either at work in the industry or in government timber management activities, or they were engaged in providing goods and services to the industry and its employees. So this estimate of 43 percent includes not only the logger, the sawmill worker, and other industry personnel, but it also includes the heavy equipment dealer, the truck driver, the telephone worker, the grocery clerk, and the school teacher—all those who provide goods and services either to the industry or its employees.

During the same year (1969) 51 percent of the total personal income in western Montana was attributable, either directly or indirectly, to the forest industries. Here again we include the income of industry employees and all those other people I mentioned. Although these estimates are as of 1969, the relationships change quite slowly and I would think they have not changed much in the last few years.

The wood products industry is important not only in terms of total income, but because it pays good wages to individual workers. As we pointed out earlier, per capita income in Montana is low partly because we don't have enough workers in the higher-paying industries.

In spite of the fact that per capita income in western Montana has grown faster than in the state as a whole, per capita income here still is below the state figure, and well below the national. Here are the figures for 1973, the latest year available:[2]

1973 Per Capita Income	
United States	$5,023
Montana	4,742
Eight western Montana counties	3,830

Assuming that western Montanans want to live as well, on the average, as other Americans; assuming they want adequate public services, which they must pay for through taxes; then clearly the area needs all the well-paying jobs it can get, to boost that per capita income.

[2]Source: U.S. Department of Commerce, Bureau of Economic Analysis, Regional Economics Information Service.

The following table shows what year-round wage and salary workers in industries important to western Montana earned—on the average—in 1974. These are state averages. They do not include the self-employed businessman or professional worker. The smelting figure includes copper as well as aluminum. Clearly, the forest industries, including paper, provide some of the highest-paying jobs. These figures also say something about the desirability of substituting jobs in tourist-oriented businesses (trade and services) for jobs in wood products:[3]

Earnings of Year-Round Workers in Montana 1974

Pulp and paper	$12,640
Smelting and refining, nonferrous metals	10,974
Wood products	9,304
Retail trade	5,515
Services	5,332
All covered industries	8,149

To summarize what I've been saying, then: western Montana has come to be very much dependent upon the forest industries. The industries have contributed to the growth of total employment and income and to the increase in individual incomes over the past two decades. What happens to those industries affects other business throughout the area.

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Now, what is the forest products industry and why has it grown while other Montana industries were declining? The Montana industry includes logging camps, sawmills, plywood mills, the paper mill, as well as producers of particleboard, laminated beams, modular panels, molding, window frames and sashes, door frames, end-glued products, prefabricated houses, posts, and poles.

Many of these products were not produced in Montana in 1950, when we were largely a lumber-producing area. Some of the products I named are not very important. But the industry has grown and diversified over the past twenty years. Larger mills have modernized their plants, increased their capacity and efficiency, and added new products. National firms have moved into the state, building new plants or buying out established operations. A good many small producers have dropped out.

[3]Source: Montana Department of Labor and Industry, Employment Security Division. Total includes only workers covered by unemployment insurance.

Some of us may regret both the loss of the small operator and our growing dependence upon out-of-state corporations. But there isn't much doubt that the presence of larger, better-financed units producing a greater number of products has contributed to a more efficient and more stable industry.

Timber resources, of course, explain the growth of the wood products industry in Montana. In the early fifties, the state was one of the few areas in the United States with timber to spare. Improved harvesting techniques had made it possible to harvest our steeper slopes, and improved milling methods permitted use of smaller logs. As timber supplies declined in other parts of the country, producers looked to Montana. At the same time, the industry began to make greater use of the timber resource, with the production of paper, particleboard, and other products which utilize residues that once went to waste.

To keep things in perspective, we might note that the increases in Montana production had little effect on national output. Important as it is to us, the Montana industry is not so significant nationally. Our lumber production, for instance, usually amounts to less than 4 percent of total U.S. output.

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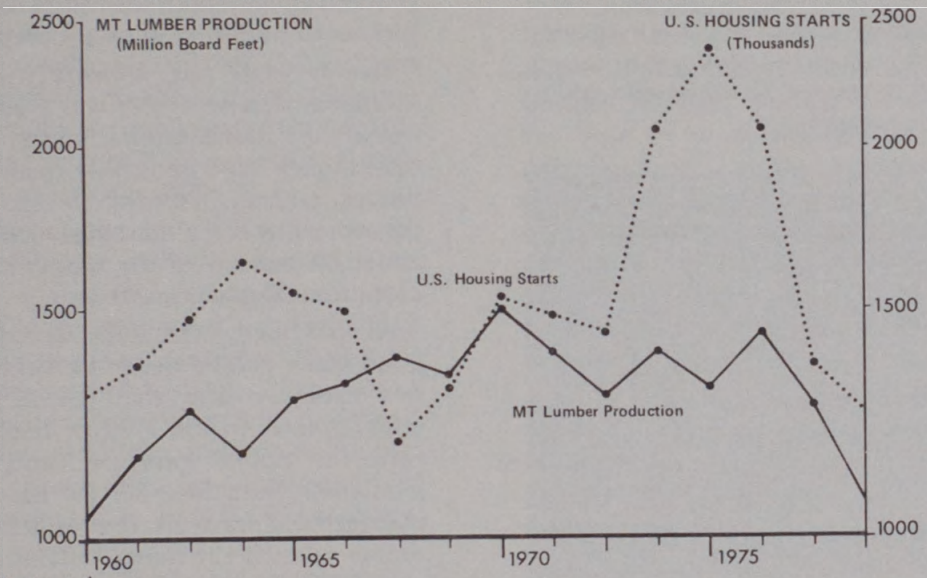
Western Montana's dependency upon the forest industries has some disadvantages. In spite of all the changes in recent years, the industry still is seasonal and cyclical. It would be nice if we had some other activities to help offset its instability.

Seasonal fluctuations in employment—those caused mostly by the weather—are not as serious today as they were in the fifties. Logging operations and smaller mills still shut down in the winter and spring, but the larger, diversified operations generally run year round.

For awhile in the sixties, it looked as though cyclical fluctuations—those caused by the business cycle—also were becoming less of a problem for the industry. Then came the recessions of 1970 and of 1974, and suddenly we were reminded again of our dependence upon national markets —particularly the national housing market. Figure 5 shows how changes in the number of housing starts affects Montana lumber production. Lumber, of course, still is our major product, and it's the only one we have yearly production figures for.

The year 1968 saw an all-time high in the state's lumber output. Housing starts declined in 1969 and

Figure 5
Montana Lumber Production and U.S. Housing Starts



Ratio scale.
Sources: Western Wood Products Association, Portland, Oregon, and U.S. Bureau of the Census.

1970, and so did Montana's lumber production. Then, between 1970 and 1972, U.S. housing starts rose to very high levels—reaching almost 2.4 million units in 1972. Montana lumber production rose, too, but it never got back to the 1968 level. (The decline in 1972 is at least partly due to the closing of the Bonner sawmill for new construction and not to market conditions.) Then, in 1973, the housing market began to take a real tumble, one that continued into 1975. Housing starts in the United States in 1975 were less than half the 1972 figure, and the average size of unit also declined as costs rose. Thus we had not only fewer units but less material required per unit. The 1975 production figure for Montana was the lowest since 1960. Between 1973 and 1975, lumber production fell by about 27 percent.

Employment declined sharply, too—by about 14 percent or 1,400 workers between 1973 and 1975. Most of the decline occurred in late 1974 and in 1975. It could have been worse; employers often chose to reduce the work week rather than lay off workers. The average number of hours worked per week fell from about 41 in 1973 to 36 in 1975. Even so, the unemployment rate last year averaged about 11 percent in the Missoula area (Missoula, Sanders, Mineral, and Ravalli counties) and 13 percent in the Kalispell area (Flathead, Lincoln, and Lake counties), and layoffs in the forest industries were mostly responsible for the high rates.

The last seven years, then, have witnessed a great deal of instability in wood products employment. We can only reflect on what it might have been like if we had been tied just to lumber as we were in the early fifties.

All of these figures are for the state; we don't have industry data for western Montana. As I said earlier, about 90 percent of wood products activity is in the eight western counties.

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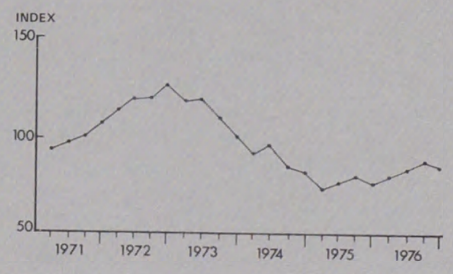
What does the immediate future look like for the forest industries? The F. W. Dodge Division of McGraw-Hill Information Systems Company says things may pick up some this year—but not a lot. Dodge, as you know, publishes a construction activity outlook report every year. Figure 6 gives their prediction of the demand for lumber, millwork, and plywood for use in new construction in 1976. They see the demand for these products up a little from last year (from 5 to 10 percent), but well below any other recent years.

The Dodge people base their prediction on the following assumptions. They see the current recovery as fragile. They point out that present national economic policy is conservative, especially in terms of monetary policy. Tight money, of course, always threatens the housing industry. They do anticipate some easing of the money markets, because 1976 is an election year.

They believe energy projects and the subsidies

they require will have top federal government priority during the last half of the seventies, and that federally-subsidized housing will be a lower priority. Given the high cost of housing in relation to income these days, they see no way the housing boom of the early 1970s can be repeated without substantial subsidy programs.

Figure 6
New Construction Demand for Lumber, Millwork and Plywood, 1971-1976



Constant dollars; seasonally adjusted. 1971 = 100
Source: McGraw-Hill Information Systems Company.

In its report prepared in October, assuming no subsidies but with an easing of monetary policy, Dodge foresaw a maximum of 1.6 million housing units in 1976. Other forecasts say 1.5 million. (Since Dodge prepared its forecast, the Department of Housing and Urban Development has announced a new home mortgage interest rate subsidy program for low and moderate income families. It should be in operation by spring and may provide financing for up to 250,000 new or rehabilitated units over the next two years.) The 1.6 million units would be a gain of 40 percent over 1975, but the number still would be below housing's boom years of 1971-1973. Furthermore, Dodge economists see only 1.7 or 1.8 million new units in 1977. If they are in the ball park, then, the housing industry may soon recover to what used to be (before 1971) quite a respectable level—one that should create a better market for Montana wood products.

The paper market has been picking up some recently. The Missoula mill expects to run without interruption through April 1. Its management expects a better year in 1976, with fewer layoffs than in 1975. The mill employs about 500 people.

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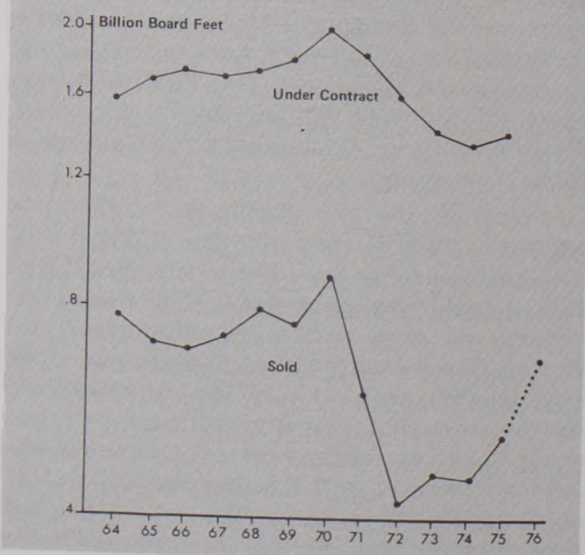
The forest industries have had some difficult years recently, thanks to the national recession and the instability of the housing market. But the industry has other problems too. Those problems have to do with the resource base—the timber. And there's no way we can talk about the future of wood products without considering these problems.

Twenty years ago, industry was expanding in Montana because timber was available. Most of it was in the national forests. Between 1952 and 1969, total timber harvested more than doubled, while timber cut on national forests increased 181 percent—that is, it almost tripled. In the late sixties, about 60 percent of the timber cut in Montana came from the national forests.

As this huge increase in cutting continued, a good many people began to feel that the harvest was excessive and that it was damaging the environment. In the light of this environmental concern, public pressure, and new federal legislation, the Forest Service has reevaluated its management practices. The result has been smaller timber sales and increased harvesting costs on the national forests.

Figure 7 shows what has happened to Forest Service timber sales over the past twelve years. Before 1970, timber sales fluctuated mostly because of economic conditions. Since 1970, the major influence has been the amount of timber the Forest Service has offered for sale. There was a very sharp

Figure 7
National Forest Timber Sales, Fiscal Years 1964-1976, and Uncut Timber Under Contract at End of Year



Ratio scale
Source: U.S. Forest Service, Region 1.

decline of more than 50 percent between 1970 and 1972, and it caused the industry a great deal of concern. Since 1972, sales have increased gradually. The projected figure for fiscal 1976, the year ending next June 30, is 662 million board feet. This includes 95 million feet of dead and down timber, thinning, etc., suitable for pulp and particleboard but not for lumber. Nevertheless, 1976 Forest Service sales should be the highest since 1970.

The industry has been cutting less timber on the national forests recently, partly in response to the reduced supply and partly because of economic conditions. Still, the amount of national forest timber under contract today is about 20 percent less than it was during the late sixties. This is about a two years' supply under normal cutting conditions. Mills like to have about two and one-half years' supply on hand. It gives them a greater flexibility in their operations, and their bankers like to know that they have raw materials available.

The smaller volume of timber sold has, of course, resulted in increased competition and higher stumpage prices. But the new management policies also have meant higher harvesting costs as the industry is required to meet new standards for roads, cleanup, etc.

I am not a forester and I cannot evaluate either the policies or the way they are being applied. Like most people, I recognize that higher costs are necessary to protect environmental values; like others, I am uneasy at the apparent absence of adequate economic yardsticks in some decisions. In any event, what all of this means is higher production costs.

As the harvest on national forest lands has declined, the cut on private lands has increased. In calendar 1974, there was as much timber cut off private lands as off the national forests in Montana. To those of us accustomed to thinking of the national forests as the predominant source of timber in this area, that really is surprising. It's fairly obvious, however, that private lands have provided a cheaper source of timber during this recession period. I suppose the question is whether the current rate of harvest can be maintained, and for how long.

All of this has implications for the western Montana economy and for western Montana business and labor. They both have a stake in a healthy forest industry.

This area is heavily dependent on wood products, and at the moment we have very few feasible alternatives. I think of no other basic, primary industry which, in the foreseeable future, is likely to provide large numbers of new jobs in western Montana.

Some people think that tourism and outdoor recreation offer a suitable alternative. I disagree. We looked earlier at earnings in various Montana industries, and we saw that workers in the trade and service groups—and that is where businesses catering to tourists are classified—earn very low wages compared to wood products and paper

employees. Jobs in motels and restaurants are not satisfactory substitutes for work at the sawmill.

I would hope that we could have both a healthy forest industry and a substantial tourist industry. However, I would tend to regard tourism as an activity providing supplemental employment and earnings, and not as a desirable economic base.

In an article in the Autumn 1975 *Montana Business Quarterly*, Paul Polzin and Dennis Schweitzer estimated that it would take 4,260 typical out-of-state tourists to generate the direct income produced by the processing of 1 million board feet of timber. Among their conclusions as to the impact of wood products versus tourism were these:

1. Simply looking at total expenditures by out-of-state tourists leads one to dramatically overestimate the dollars which end up in the pockets of Montanans. They estimated that only 20 to 25 cents of the average nonresident tourist dollar becomes direct income to residents of the state.

2. For all practical purposes, the state could not generate sufficient growth in tourism to counterbalance even moderate declines in timber harvesting.

3. Even if we could generate the same amount of direct income by substituting tourism for wood products activities, there would be severe repercussions in the labor market, because of the very different kinds of jobs in the two industries.

4. And the authors reiterate the statement that I made earlier, that we should be able to have both industries. They point out that tourism does make an important contribution to the Montana economy.

§

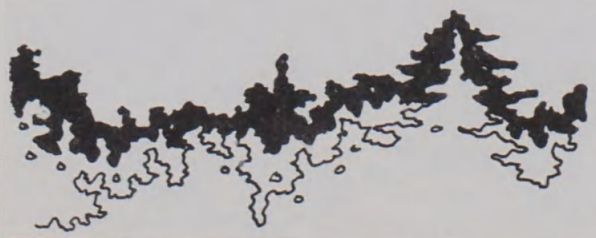
Wood products will continue to provide western Montana's economic base, and it may even provide some new jobs over the next few years. We will see greater use of forest residues—materials formerly left in the woods after logging—and of timber unsuitable for sawlogs. The Hoerner Waldorf Corporation has labeled this 5 D wood—meaning

trees that are dead, dying, down, diseased or defective.

The forest industries are not likely to expand as they did in the fifties and sixties, but they will provide some new jobs between now and 1980.

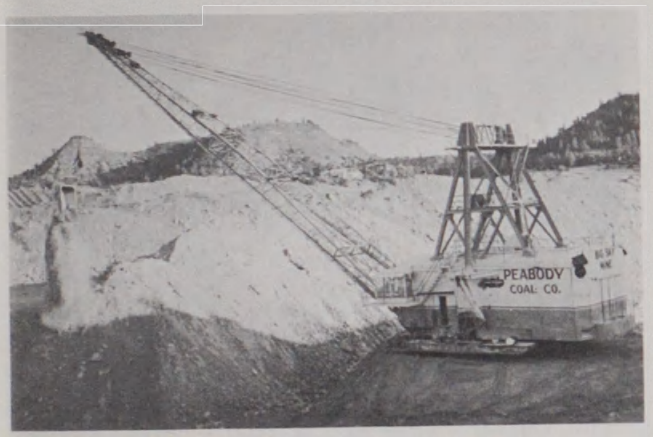
A great deal depends on the availability of the resource—especially sawtimber. I would expect that when this recession ends, the housing market picks up, and the demand for lumber is high again, we'll be hearing more about Forest Service timber sales and other federal policies.

It seems to me there are at least two things all of us can do for our own self-interest, as well as for the welfare of the western Montana economy. First, we can insist on reasonable compromises with respect to public lands management—compromises that include economic welfare as part of our environment. We can do that, I believe, without relinquishing a concern for the physical environment. And second, we can encourage greater investment by the federal government in timber production and management in those areas of Montana where such an investment is justified. Efforts such as these will help the industry and all of western Montana. □



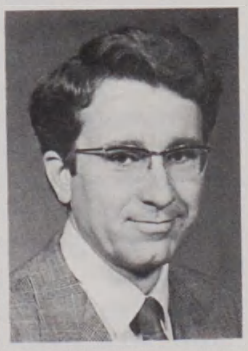
Erratum:

P. 49, *Montana Business Quarterly*, Autumn 1975: "The negative 18,830 present dollars indicates that the borrow-purchase option is more desirable than the lease option . . . ." should be "The negative 18,830 present dollars indicates that the *lease* option is more desirable than the *borrow-purchase* option . . . ."



WILL COAL GASIFICATION COME TO THE NORTHERN GREAT PLAINS?

RICHARD STROUP AND
WALTER THURMAN



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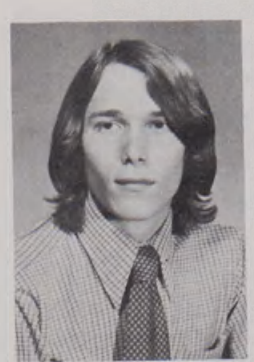
Interest in the gasification of coal has grown substantially in the last few years, as natural gas use in the United States has increased and proved reserves have fallen.[1] Since the states of Montana, Wyoming, and North Dakota have large supplies of coal accessible by stripping at relatively low cost, much of the nation's interest is focused in this region. Water, another crucial input to coal gasification, also is available though the social cost of using water in this fashion is being vigorously debated. The extent of coal gasification over the next several years will do much to determine the total impact—feared by some, desired by others—which coal development will have on the region.

The history of coal gasification technology goes back to 1670.[2] Probably the most thoroughly proven technology is that used in Lurgi units, of which more than fifty have been built. The Lurgi process, first developed in Germany over fifty years ago, combines crushed coal with steam and oxygen under high pressure to make a mixture of hydrogen, hydrocarbons, nitrogen, and carbon oxides. However, the production of pipeline-quality gas requires that the commercially unproven process of methanation be used, removing all carbon monoxide, some carbon

[1]The reserves-to-production ratio fell from 18.9 in 1963 to 9.7 in 1973. Federal Power Commission, *National Gas Survey* (Preliminary Draft), Vol. I (n.p., n.d.), p. 31.

[2]For a brief history and description of coal gasification technology, see Office of Coal Research, U.S. Department of the Interior, *Evaluation of Coal Gasification Technology, Part I: Pipeline Quality Gas* (Washington, D.C.: Government Printing Office, 1973).



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A billion-dollar question

dioxide, and raising the heating value to 900-1,000 British thermal units per standard cubic foot (Btu/scf). Newer technologies are also being explored, but the first plants are expected to use the Lurgi process with methanation.

The decision as to how much coal, water, capital, and other resources to devote to coal gasification is, of course, an economic decision. To predict the time path of gasification development one must consider both the cost and the value of the product. It is also true that simple managerial economics is insufficient in this case to yield good predictions. Governmental regulation of gas production, pricing, and distribution, as well as plant siting, water use, and other aspects of plant location, make this a question of political economy. The forecaster's judgments must be tempered by recognition of these nonmarket determinants. Still, the purely economic factors seem likely to have a powerful influence. If expected costs are very much higher than expected product value, it seems unlikely that extensive development will occur. Likewise, costs which are relatively low would be expected to militate persistently for development of facilities. Even though government has the power to purchase for people that which costs more than it is worth to those people (individually or as a group), and the power to tax low-cost (to individuals or to society) alternatives out of existence, we believe that when the costs *clearly* are too great, a program is not likely to be undertaken.

An expensive and untried process

Since commercial-scale plants to make SNG (substitute natural gas) from coal have never been built in the United States, there is substantial uncertainty concerning costs. However, the "Synthetic Fuels from Coal" Task Force Report of the *Project Independence Report* provides cost estimates for high-Btu gas plant construction. Both capital requirements and projected fuel prices are uniquely usable, in that breakdowns of component costs are given along with the projections. Those projections are the basis for the following cost estimates.

In late 1973 dollars, total capital requirements for a 23-billion Btu-per-day (approximately 250 million cubic feet per day) plant with methanation were estimated at $427,097,000.[3] Assuming coal costs of $4 per ton and (unrealistically) utility financing at 9

[3]U.S. Department of the Interior, "Synthetic Fuels from Coal" Task Force Report of the *Project Independence Report* (Washington, D.C.: Government Printing Office, November 1974).

percent, a unit price of $1.44 per million Btu was derived.[4] When these assumptions are updated, with capital investment at $800 million,[5] coal at $4.50 per ton,[6] interest rates at 9 percent, and using updated operating cost figures, the cost rises to $2.18 per million Btu, in late 1974 dollars. A more recent and concrete estimate of unit price comes from the American Natural Gas Company, proposing a Lurgi plant in North Dakota. Their current estimate is $2.58 per thousand cubic feet (roughly comparable to and somewhat lower than a million-Btu price). This price includes limited transportation to the distribution network and is given in late 1974 dollars.

Estimates assuming other than utility financing project a considerably higher price of gas from the same plant. Given the uncertainty involved, traditional utility-style financing, based on minimum risk considerations, appears to be inappropriate. Project Independence arrives at a price of $2.55 per million Btu when the plant is investor-financed with a 15 percent discounted cash flow (DCF).[7] This figure is projected under cost assumptions similar to the $1.44 figure that assumes 9 percent utility financing. If the 15 percent DCF numbers have changed by the same percentage as the utility finance figures, the appropriate cost becomes $3.86 per million Btu. Recent off-the-record conversations with industry and government personnel, as well as newspaper reports, suggest that updated cost figures would be about $1.3 billion for plant construction, and about $4.50 per million Btu for gas output in 1975 dollars.

[4]Ibid., p. 36.

[5]From a conversation with Dr. Seay, American Institute of Gas Technology, concerning the proposed Four Corners area and North Dakota coal gasification projects.

[6]An aggregate figure of 14 million tons of bituminous coal shipped from Montana mines in 1974, as reported by Ralph King, Associate Director of the Montana Bureau of Mines, in a telephone conversation, July 24, 1975.

[7]*Project Independence Report*, p. 36.

However, the $3.86 figure is both defensible and more conservative, and we will use it for later comparisons.

In any cost consideration of synthetic coal gas, it should be kept in mind that pipeline-quality gas production is not a commercially proven technology. Further research and development need to be funded and carried out before the first plant operates. For example, significant amounts of development are required in high-pressure feed systems,[8] pollutant analysis and control,[9] application of technology to various coal types,[10] the methanation process,[11] and scaling-up processes from experimental to commercial size.[12]

In addition to these more scientific areas of research and development, work is needed on engineering problems of actual plant construction. These include unsolved problems of field erection and fabrication of pressure vessels.[13] The large size of such vessels precludes shop fabrication and necessitates field adaptions of precision techniques previously untried.

Substitute natural gas: too costly to compete?

The value of gas made from coal is determined by the value of (demand for) energy, and the price, availability, and suitability in use of energy from other sources. Greater demand for energy increases the value of SNG, while lower price, greater availability, and greater suitability in use of other energy sources lowers the value of SNG.

Energy use in the United States has been rising for many years; in 1974, however, energy consumption fell by 2.7 percent.[14] This is consistent with the fact that in real terms (corrected for inflation) energy prices fell steadily for decades until 1973, when they began to rise sharply.[15] The available estimates indicate that energy use will decline from 1.5 percent to 5 percent if energy prices rise 10 percent.[16] Of course, the economic recession of the time, social pressures, and population growth probably had significant impacts also. To calculate the demand for SNG as a function of its price, one must consider these factors as well as the prices of substitutes.

The most important competitor for SNG is, presumably, natural gas. Both the price of natural gas and its supply are critical determinants of the need for gasified coal. Indeed, recent shortfalls of natural gas supply are the reasons for serious consideration of the technology. An understanding of the nature of these shortages is crucial to a reasoned analysis of the supply options available.

While natural gas has a high value, especially to home consumers, due to its clean and continuously deliverable nature, the Federal Power Commission controls its price below a market-clearing level (the amount produced that equals the amount demanded). Until recently (1970), new wellhead prices were below $.20 per thousand cubic feet. With prices controlled at this level, the value of gas was understated, demand for it was overstimulated, and incentives to explore and produce were retarded. Now, the Federal Energy Administration has projected forced curtailments of gas contracts of 2.9 trillion cubic feet for the twelve months starting April 1975, as reported in *Weekly Energy Report* for September 1, 1975. Production for 1974 was approximately 22 trillion cubic feet. Some states will see cutbacks of up to 45 percent of demand at the regulated price. Dislocations from shortages of this magnitude can and will be serious, but will the considered costs and value of SNG lead to its use in plugging the supply-demand gap?

A critical question is whether gas could be made available at prices lower than SNG costs, in great enough quantities to eliminate SNG demands. To answer this question quantitatively requires the consideration of many forces interacting in dynamic and complex ways. Such a study has recently been done at the Massachusetts Institute of Technology Energy Laboratory, primarily by Paul MacAvoy and Robert Pindyck.[17] Their econometric modelling and simulation of phased deregulation

[8] *Evaluation of Coal Gasification Technology*, pp. 23, 39, 44-45; James R. Garvey and others, *Final Report of the Supply-Technical Advisory Task Force—Synthetic Gas-Coal* (Washington, D.C.: Federal Power Commission, April 1973), p. VI-2.

[9] *Project Independence Report*, pp. 23, 83-90; *Final Report*, Chapter X.

[10] *Project Independence Report*, p. 24.

[11] *Evaluation of Coal Gasification Technology*, pp. 26, 44; *Final Report*, pp. VI-4, VI-5.

[12] *Project Independence Report*, p. 24.

[13] Ibid., pp. 63, 68-70, 118.

[14] Council of Economic Advisers, *Economic Report to the President* (Washington, D.C.: Government Printing Office, 1975).

[15] Edward Mitchell, "The Energy Dilemma: Which Way Out?," Reprint No. 32 (Washington, D.C.: American Enterprise Institute, June 1975), p. 3.

[16] Nathan Edmonson, "Real Price and Consumption of Mineral Energy in the U.S., 1900-1968," *Journal of Industrial Economics* (Manchester, England), forthcoming; Edward Hudson and Dale Jorgenson, "Energy in the United States: Projections and Policy" (manuscript submitted to the Ford Energy Policy Project, 1974).

[17] Paul MacAvoy and Robert Pindyck, *The Economics of the Natural Gas Shortage (1960-1980)*, (Amsterdam: North-Holland Co., 1973).

of natural gas indicates that at an average wholesale price by 1980 of $.61, the amount of natural gas supplied would satisfy demands, leaving no market for the more expensive SNG. Their calculated supply responses are questioned by some experts.[18] Yet even if their projected equilibrium price were quadrupled to $2.44 per million Btu, SNG produced with investor financing at $3.86 per million Btu could not compete. In the Northern Plains states' own markets, partially dependent on Canadian gas imports of questionable future, fully continued reliance on natural gas may require new pipeline construction which might be more extensive than construction required to move SNG made within the region. No estimates of such cost comparisons are available, to our knowledge, but the spread between $.61 and $3.86 is so great that a reversal of cost positions seems very unlikely.

Another important competitor, at least for industrial sales of SNG from coal, is coal itself. At a price of $4.50 per ton, coal costs about $.265 per million Btu,[19] as compared to the $3.86 per million Btu cited above for SNG. Much of coal's substitutability with gas is dependent on the availability of pollution control technology;[20] and, of course, transport costs and burning efficiencies will differ. Still, coal appears to be a much cheaper supplement to natural gas in many large-scale uses than SNG.

While large-scale and industrial gas users may be expected to react promptly to higher gas costs, the residential and commercial space heating sector is likely to exhibit a more inelastic, slower response. Still, competitive alternatives exist. Electricity, generated from coal or other sources, is a relatively low-cost option considering modern heat pump technology. O. Hammond and M.B. Zimmerman,[21] of the M.I.T. Energy Laboratory, project heating costs significantly lower from electricity-powered heat pumps than from SNG, using assumptions biased in favor of SNG technology and gas-burning efficiency.[22]

In some cases, fuel oil, liquefied petroleum gas (LPG), and low-Btu gas produced for nearby boilers may also compete with SNG, but generalizations are difficult, as estimates on price and availability vary. The outlook regarding solar, wind, tide, and other more exotic energy sources also varies with the observer. However, many believe that by the year 2000, substantial production from one or more of these sources is likely.

No coal gasification likely in this decade

Since predicting the time path of coal gasification is a problem in political economy, some assumptions must be made regarding the goals or preferences to be exhibited by decisionmakers in and out of government. The fundamental assumptions made here are that energy users will try to minimize the cost of energy consumed, and will react to higher energy prices by decreasing their energy use. Available data support these notions. Also, it will be assumed, as least in the "most probable" projections, that regulatory agencies move in the direction tending to encourage cost minimization in energy supply.

Given the cost estimates for SNG from coal, and the apparent availability of natural gas at costs much less than SNG cost estimates, the market for SNG seems not to exist. Even if the M.I.T. market-clearing price of $.61 per million Btu of natural gas is quadrupled, natural gas should be cheaper than SNG. The long-run availability of gas is very much in

[18] As a basis for their supply response projections, MacAvoy and Pindyck used physical gas reserve estimates from the Potential Gas Committee, an industry organization unique in its access to proprietary information.

For purposes of comparison, below is listed the PGC estimate of potential supply along with comparable estimates from other sources. (These figures do not include proved reserves.)

Potential Gas Committee (as of 12/31/72, excluding Alaska) - 780 trillion cubic feet.

COMRATE (Committee on Mineral Resources and the Environment, Commission on Natural Resources, National Research Council) (National Academy of Sciences, 1975) - 530 trillion cubic feet.

King Hubbert (well-known mineral resource analyst for the U.S. Geological Survey) (1974) - 540 trillion cubic feet.

Vincent McKelvey (Director, U.S. Geological Survey, 1975) - 320-655 trillion cubic feet.

[19] The price of coal varies widely with location, coal characteristics, and mining conditions, but $4.50 per ton is roughly representative of early 1975 prices in the Northern Great Plains region. The $4.50 figure is the same one used in calculating SNG costs above. These calculations assume 17 million Btu per ton of coal. Note that as coal at the mine rises in price, SNG energy rises in cost faster than does energy from coal burned directly, since more coal is required to produce a unit of SNG energy.

[20] For a recent summary on the crucial problem of flue gas desulfurization, see J. Jonakin, "Solving the SO_2 Problem—Where We Stand with Applications and Costs," *Coal Age*, May 1975.

[21] Ogden Hammond and Martin Zimmerman, "The Economics of Coal-Based Synthetic Gas," *Technology Review*, July/August 1975.

[22] Included in the assumptions were SNG prices (delivered) at $3.65 per million Btu and electricity at $.043 per kilowatt-hour. Adoption of heat pump technology may be more likely, or more important, for potential SNG export markets than for the Northern Plains states' own demands, due to decreased heat pump efficiency at very low temperatures.

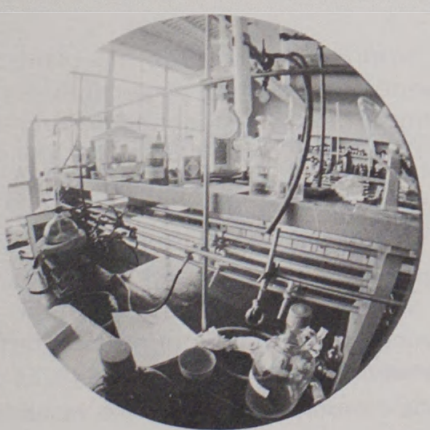
question, however, as geologic experts disagree on potential production from reserves (see footnote 18). Virtually all estimates, though, appear to suggest that we can continue to have domestic gas availability beyond the year 2000, provided that annual use does not increase dramatically—and much higher prices should strongly encourage conservation rather than greater use. Also, even if natural gas is available in substantially smaller quantities, the cost advantage of energy derived directly from coal, along with coal's acceptability in industrial markets, will allow existing industrial gas supplies to be channeled to other, higher-valued uses.

All factors considered, we forecast that there will be no commercial production of SNG in the Northern Plains in 1980 or 1985. Since commitments must be made in the next two to four years for production by 1985, we are reasonably confident in this forecast. To predict output of SNG (or any other commodity) in the year 2000 is exceedingly difficult. Society's ignorance of fossil fuel reserves—which is rational in light of the cost involved to learn much more—together with the uncertainty of foreign fuel source prices and availabilities, makes forecasting natural gas production for the year 2000 almost a guessing game. We arbitrarily will assume that cost relationships, technology, and regulatory factors will remain close enough to the currently foreseeable situation that SNG production also will remain infeasible economically at that point.

Obviously, if we change our assumptions to be more adverse toward SNG production, our "low" forecasted amounts would remain at zero. If we change our assumptions to be more favorable toward SNG production, the predictions could change. For example, if technological advances substantially reduced SNG costs, and if natural gas were far less available in the future even at much higher prices (or at low controlled prices), while engineers were unable to design environmentally acceptable ways to switch many users from gas to coal, then SNG might become feasible.[23]

Another possibility is that with continued strong regulation holding down the domestic price and availability of natural gas and oil, the resulting shortages might produce such pressures that instead of allowing higher natural gas and oil

[23] Another factor of some importance in the Northern Plains is the potential elimination of Canadian supplies, although such a move would seem to be a large economic error on Canada's part, given the price they get for the exports as compared with internal Canadian prices. In the national picture, these amounts are small.



prices, Congress might grant enormous subsidies in an effort to supplement supply and to encourage SNG production.[24] The apparent rationale for such a move would be to keep gas prices low to the consumer. But with presently projected SNG costs, the social cost of such energy would certainly be higher than under alternative regulatory and technological options.

The high cost of synthetic gas could be masked, to some extent, by averaging the cost in with regulated, low-priced natural gas ("rolling in"), thus making the gas marketable and the venture profitable for the producer. But a rolled-in price is artificial in that it doesn't represent the true cost to society of producing the gas. When the social cost (eventual consumer and taxpayer cost) is realized, SNG emerges as a high-cost solution.

Because of our assumption that regulators tend toward economic rationality, we do not really expect that chain of events to occur, but we recognize its possibility, so that our "high" forecast, at this point rather arbitrary in nature, is that while no plants will be in production by 1980, one in each state will be operating by 1985, with no further change by the year 2000.

Summary of Projections
SNG Plants in Montana, Wyoming, and North Dakota

	1980	1985	2000
Most probable	0	0	0
Low	0	0	0
High	0	3	3

Note: All plants rated at 250 million standard cubic feet per day.

Not everyone agrees

The projections we have made are generally lower than other contemporary forecasts of gasification activity. We would particularly like to address the differences between this report and that of the Northern Great Plains Resources Program (NGPRP), possibly the most extensive and visible of those other forecasts.

[24]For a discussion of this possibility, see Richard Stroup and Verne House, "The Political Economy of Coal Gasification: Some Determinants of Demand for Western Coal," Staff Paper 75-17 (Bozeman: Department of Agricultural Economics and Economics, Montana State University, 1975).

The NGPRP report, *Effects of Coal Development in the Northern Great Plains* (Denver, April 1975), forecasts three Coal Development Profiles: one "probable," one "high," one "low." Their most probable projection is for no SNG plants in 1980, seven in 1985, and sixteen in 2000. Their high projection is for seven plants in 1980, thirteen in 1985, and forty-one in 2000. Their low projection predicts no gasification activity up to 2000.

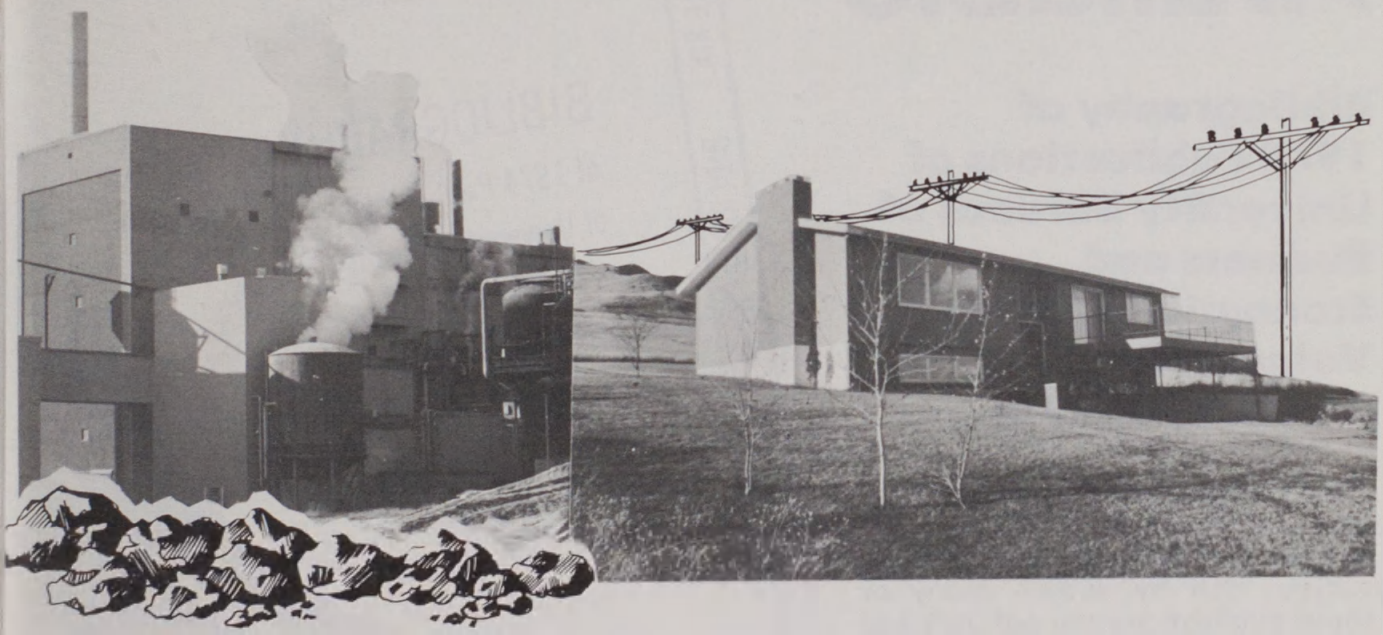
NGPRP's section on gasification is a small part of a much larger report on coal activity in general. Presumably because of the section's size relative to the complete report, little information is given as to the methodology which led to the specific numbers used in the gasification forecasts. This makes comparison difficult. But general assumptions of energy growth and relative prices were made explicit; and, on the basis of these, the following comparisons are offered.

First, consider the area of technological certainty. While the NGPRP report is dated April 1975, the synthetic gas component apparently was completed soon after June 1974, when "a number of energy companies" had shown "substantial interest" in Northern Great Plains gasification and had "invested in research programs and plant development planning." At that time, they listed over half a dozen announced plants to be built in the area.

At this writing (Otober 1975), no plants have gone beyond the planning stage; industry as a whole seems to be waiting for either technological breakthroughs or government subsidy. All known projects have been indefinitely shelved. A quotation from the September 1, 1975, *Oil and Gas Journal* sums up this attitude: "Commercial and technological uncertainties are too great for financing at this time, given the questions over markets, prices, costs, and performance of facilities once constructed."

A second assumptive difference leading to different conclusions in the two reports is over the question of future supply and demand for natural gas.

NGPRP's energy demand forecasts came from a Department of the Interior publication, *United States Energy Through the Year 2000* (1972). From the total demand figure, gas was allocated a share of the market based on current usage patterns. Characterizing the Department of the Interior forecast is a quote from a draft of the NGPRP report, ". . . this forecast is essentially an extrapolation of current trends based on a knowledge of how the various sectors of the



economy use energy and how these sectors are growing. It does not deal explicitly with the effect of price changes on the demand and supply of energy resources, and, consequently, does not recognize any energy savings or supply increases that could result from persistent increases in energy prices."

The NGPRP gas demand estimate, then, was not tempered by any conception of demand or supply price elasticity. Our assumption is that any price increase, either in gas itself via complete or partial deregulation or in other substitute fuels, will dampen demand. This is an integral part of the M.I.T. Energy Lab econometric model (which we cite), which predicts an average field price in 1980 of $.61 (in 1974 dollars). At this point, quantity supplied would equal quantity demanded through increased supplies *and* decreased usage.

In consideration of potential gas supply, it must be noted that the M.I.T. model is more optimistic concerning supply response to price than is the Department of the Interior forecast. In part, this could be due to reliance on differing figures for potential physical supply of gas.

The third area for comparison of the two projections is that of interfuel competition. We use a currently projected price of SNG at slightly under $4 per thousand cubic feet (1974 price), which is supported by recent claims from utilities and the *Project Independence Report*.

In its comparison of SNG prices with other gas sources, NGPRP used a figure of $.91-$1.27 per thousand cubic feet (1972 dollars) from the U.S. Bureau of Mines. This figure was used to demonstrate SNG's supposed competitiveness with other sources of gaseous fuel. Substitution away from gas to nongaseous fuels was not considered. Thus, the demand for gas (from all sources) was considered perfectly inelastic with respect to price. We specifically consider the switchovers, such as to electricity (in home use) and to direct coal burning (in industrial use), that would occur at higher gas prices and conclude that gasifying coal would not be competitive in any market except, perhaps, at heavily subsidized prices. □

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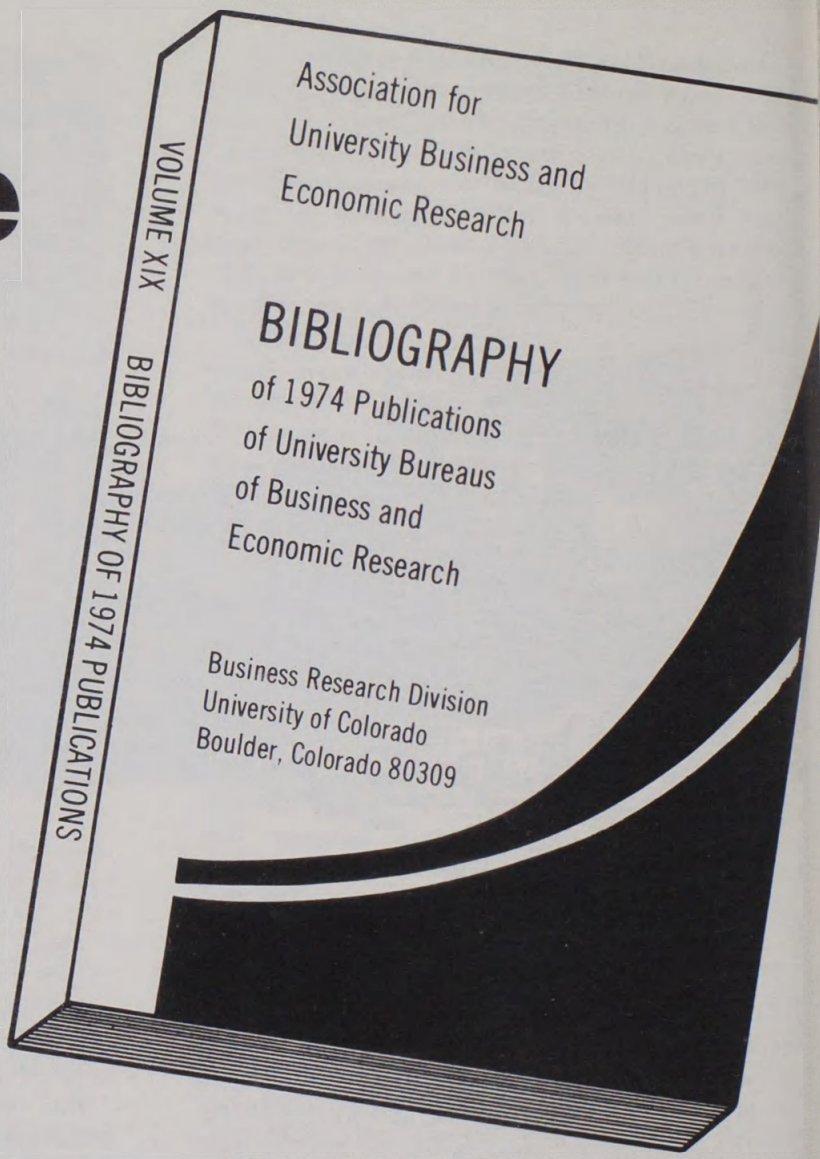

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